



ZANZIBAR PROTECTORATE

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PREFACE

A SUMMARY OF THE AGRICULTURAL POLICY OF HIS HIGHNESS' GOVERNMENT

I.—LAND

The mortgaging and alienation of agricultural land owned by Africans and Arabs is controlled and restricted by Boards instituted for this purpose under the Land Alienation Decree.

II.—FOOD AND NUTRITION

1. The active encouragement of the increased production of food crops and stock, including the reclamation, drainage and irrigation of swamp areas in order to render the Protectorate self-supporting as regards rice.

2. The control of East Coast Fever by a system of dips throughout both islands; together with the eradication or control of the tsetse fly in Zanzibar island, and the prevention of its introduction into Pemba island.

III.—FORESTRY

1. The conservation of existing forest, and the afforestation of certain areas, with especial regard in the latter case to the better utilisation of the karst country to provide fuel and timber for domestic and industrial purposes.

2. The conservation and controlled exploitation of the mangrove forests.

IV.—EXPORT CROPS

The departure from a two-crop economy (cloves and copra) by the encouragement of cacao and other promising tree or ground crops.

V.—MARKETING

1. The Clove Growers Association guarantees growers a fixed minimum price, variable from year to year, for their clove crops.

2. The Association also as and when required undertakes marketing arrangements for other export crops on behalf of producers.

VI.—PRODUCE QUALITY STANDARDS

1. Pre-sale examination of cloves, clove-stems, copra and mangrove bark under an Adulteration of Produce Decree.

2. Examination and grading before export of cloves, copra, coconut oil, mangrove bark and chillies, and such other crops, the necessity for examination of which may from time to time arise.

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SECTION I.—AGRICULTURE IN THE PROTECTORATE

GENERAL

1. Owing to the partial failure of the Uganda sugar crop some difficulty was experienced, in common with other territories, in obtaining sufficient supplies of sugar, the situation being partially relieved by importations from Mauritius. Total imports fell to 3,174 tons as compared with 4,363 tons in 1948. Rice again proved difficult to obtain, only 1,249 tons being received as against 1,692 for 1948. The programmed quota was in both cases 1,800 tons. Other imported foodstuffs, both staple and semi-luxury, were in ample supply throughout the year.

2. So far back as 1924 at least there has not been a year with a lower rainfall throughout both islands. Pemba returns are the most striking, recording an average of 50.71 inches for seven stations, against an average for the same stations, for periods varying from 9 to 30 years, of 80.87 inches. The food situation has not, however, been nearly so acute as in 1946, when the absolute rainfall, though poor, was substantially higher. This is due to the fact that 1946 was preceded by poor vuli and mchuu rains, only 21.27 inches and 20.93 inches falling, in Zanzibar and Pemba respectively, at the main clove area recording stations during the months July 1945 to March 1946, as opposed to similar figures of 32.00 inches and 39.76 inches for the same period in 1948-49.

3. The year could scarcely have been more unfavourable for the establishment of cocoa seedlings, the partial failure of the masika being followed by a patchy vuli and the early onset of the hot season. Cocoa planted in light soils with low water-holding capacity was especially badly affected.

4. Twelve established planters took 974 seedlings as replacements, and 8,900 for extending their areas under cocoa. Mainly owing to adverse conditions and to unsatisfactory temporary shade crops, only three new planters took 750 seedlings in all. These individuals have their cocoa tended by the department on a repayment basis.

5. It is becoming increasingly evident that both permanent and temporary shade are essential for cocoa grown under Zanzibar conditions. In many cases a windbreak is also desirable. Permanent shade is now being established in all Government plantation cocoa.

6. On the whole pests were not a serious factor, only coming into the picture when the young plants were already weakened by neglect or adverse growing conditions. The most important pests are as follows:—

Helopeltis schoutendeni, sap sucking.

Selenothrips rubrocinctus, sap sucking.

Systates lepidotus, leaf-eating weevil.

Anoplocnemis curvipes, large sucking bug.

A *Chrysomelid* leaf-eating beetle not yet identified.

7. No further derris was planted by cultivators in 1949, since all interested were waiting for news as to the yields and financial returns from that planted in 1947.

8. Towards the end of the year all cultivators were shown the best methods of lifting and treating the roots prior to sale, and in the end 1,134 lb. of roots were shipped to the United Kingdom by the Clove Growers Association under an advance and bonus payment system. The initial payment was 50 cents per pound, and accounts recently received show that it is possible to make a bonus payment of $69\frac{3}{4}$ cents, making a total payment to growers of Shs. $1.19\frac{3}{4}$ per pound.

9. As an example of the inertia which has to be overcome it might be mentioned that 19,410 cuttings planted in 1947 only resulted in 3,980 plants to be harvested in 1949. Out of 43 cultivators 17 had no living plants left. While the year was undoubtedly an unfavourable one and some of the sites chosen were rather too dry, nevertheless this indicates neglect rather than bad luck, as was evinced by the weedy and overgrown nature of some of the plots.

10. About half of the cuttings planted in 1948 have also died, but it is hoped that there will be about one-quarter of a ton of roots to lift in 1950.

11. The 50 cents advance on the crop already harvested was reasonably well-received and, as the final payment is a good one, production and interest generally should be considerably stimulated.

12. A large number of chillie seedlings were distributed, the main demand being at Makunduchi, where 61,700 were taken up by local cultivators. The recent rise in the market price of this crop will undoubtedly encourage production, despite its unpopular nature.

13. Tobacco-growing remains popular, but the abnormally dry season reduced the quantity of coil tobacco, estimated as being likely to be available for export from the 1949 crop, to 25 tons as compared with 64 tons for the previous year. Efforts are being made to find a cigarette tobacco which can be satisfactorily cured under Zanzibar conditions.

14. Kapok continues to grow in favour as a profitable side-line for export.

AGRICULTURAL DEVELOPMENT PROGRAMME

15. A further Agricultural Development Officer was appointed in November to take the place of an Agricultural Officer seconded to "Sudden

Death" control. Despite the shortage of Assistant Agricultural Officers, who would normally be engaged mainly on extension work, substantial progress has been maintained.

16. The land for the remaining demonstration plot in southern Pemba was acquired towards the end of the year. This will be almost entirely utilised for cocoa and other tree crops.

17. Small milking herds have been established at Matangatwani and Ole in Pemba, and Hanyegwa Mchana in Zanzibar. This policy is to be extended, both on general economic grounds and in the hope of discovering a good milking strain for subsequent use at Kizimbani.

18. In general the initial results of the programme of crop development seem to point towards cacao and derris as new cash crops for the clove areas, and to tobacco, sunflower, and chillies for the coral areas. Kapok, of which further importations are being made, is applicable to both types of country.

Considerable progress has also been made in investigating the manurial requirements of different soil types, and it has been shown that the manuring of rice land with artificial fertilisers gives very satisfactory economic returns.

19. The essential layout of the vegetable-growing scheme is now completed, and plots will be leased to growers during 1950. A fair quantity of vegetables were raised during the year and valuable information obtained as to their water and soil requirements under irrigation.

20. The processing units at Mdo (Kizimbani), Selem and Matangatwani were completed during the year, and did a certain amount of work both for the department and the public. At Mdo, despite mechanical troubles and a poor crop, over 2½ tons of paddy were milled for the public.

21. The Kizimbani Stock Farm has had a most satisfactory year, both from the standpoint of health and the condition maintained by the stock, during a period which was climatically most unfavourable. Unfortunately there are few signs that any progress so far made has been of a genetic nature.

22. The dipping of privately owned cattle in Zanzibar, at one time making steady progress and obviously beginning to be appreciated by the people, has been seriously threatened by the stubborn opposition, having no regard whatsoever to the actual merits or demerits of dipping as such, of a small but influential section of the community in one of the most important areas. In Pemba, where two dips were completed during the year and another is under construction, dipping seems to have caught the popular imagination and so far the response has been excellent.

FORESTRY DEVELOPMENT PROGRAMME

23. The Forest Officer was in the territory for the whole year, during which time he compiled the following reports as guides to future work:—

"Reconnaissance Report on the Forest Problems of the Zanzibar Protectorate."

"Working Scheme for the Mangroves of the Zanzibar Protectorate."

"Working Scheme for the Prison Fuel Plantations."

24. The scheme for the protection and conservation of the mangrove forests provides for the controlled and rotational cutting of all areas in order to ensure orderly regeneration accompanied by steady revenue, as opposed to the fluctuating cutting of past years and excessive exploitation in times of high prices.

25. The prison fuel scheme provides for the proper working of the existing fuel plantations and the afforestation of new areas of land already in the possession of Government but not hitherto developed. The first thinnings of the existing plantations produced some 250 tons of fuel, sufficient for about $1\frac{1}{2}$ years supply for the Prison and Mental Hospital. Final felling of the plantations, on a twenty-year rotation, will start in 1950, each area being at once replanted, or in the case of some tree species, allowed to regenerate.

26. The catchment area which serves the springs constituting Zanzibar's rightly famous water supply, has in places suffered serious damage from erosion. In fact the "Pink Terraces", one of the worst products of this erosion, have themselves become famous. The "danger area" constitutes some 3,000 acres, and extensive measures to repair the damage and combat its further extension will have to be taken.

27. A scheme for the afforestation of the Kichwele and Pangeni shambas, some 1,200 acres of orchard bush with a little secondary forest, in the centre of Zanzibar island, has been prepared. The work will be carried out by prison labour, established in suitable camps, and will be spread over 20 years.

28. The "bush" country, consisting of coral rag and open grassy plains with a thin covering of soil over the coral, is continually being selectively cut over for fuel for lime and charcoal-burning and in the interests of shifting cultivation. Control and rehabilitation will have to be effected, and in the meantime experiments are being carried out to ascertain the most suitable tree species for the area.

29. So far *Cassia siamea*, *Acacia auriculiformis*, *Casuarina equisetifolia* and *Eucalyptus* spp. have given the most promising results. Many other species are on trial.

30. A small forest staff has been recruited and is, as circumstances permit, being trained in forest work.

FISHERIES DEVELOPMENT

31. A Fisheries Officer was appointed in September, and a Fisheries Development Scheme approved by the Secretary of State in December. Pending the construction of a suitable fishing boat it will only be possible to do preliminary work in inshore waters. This will include an investigation into the possibility of crawfish canning.

32. The East African Fisheries Research Organisation is to be based on Zanzibar, the choice being dictated by its central situation and existing port facilities.

CLOVE RESEARCH SCHEME

33. The following paragraphs are a brief précis of the Director of Clove Research's report for 1949:—

34. A study of the insect fauna of typical clove soils having failed to reveal any more likely vector all insect transmission work has been confined to the scale *Saissetia*.

35. Up to the present all attempts to transmit the disease by mechanical inoculation have proved unsuccessful. Work on transmission by grafting has been hampered by the lack of a really satisfactory technique, only 74 successful unions having been made out of 1,420 attempts.

36. Grafting to other stocks, with the dual purpose of testing other species of *Eugenia* as disease indicators and of finding a more suitable stock for the clove, has been continued.

37. A total of 774 seedling approach grafts have been made but the scion almost invariably dies after being severed from its own roots. Indications are that the clove and all other *Eugenia* species so far tested are incompatible, as clove to clove grafts are almost invariably successful.

38. Physiological studies show that the stomatal mechanism of the clove is affected at a comparatively early stage of the disease and that affected trees have a more favourable water balance than healthy ones. This indicates that the reduced assimilation and transpiration which are a feature of the disease are due to some effect on the stomatal mechanism and not to a failure of the water supply from the roots.

39. Evidence, not yet conclusive, has been obtained which favours the view that the less serious disease known as "Dieback" is caused, at least in part, by a weak fungal pathogen.

WEATHER

40. As stated in paragraph 2 of the report, weather conditions were abnormally unfavourable to crops of all kinds. The following comparative table gives examples of some of the low rainfalls recorded:—

	1949 rainfall in inches	1948 rainfall in inches	Average
Victoria Gardens, Zanzibar ...	36.54	76.01	64.74" 13 years
Kizimbani, Zanzibar ...	54.56	77.62	72.87" 16 "
Chwaka, Zanzibar ...	38.14	74.30	49.64" 27 "
Wete, Pemba ...	45.16	94.02	77.97" 30 "
Mtambile, Pemba ...	71.53	98.75	93.72" 16 "
Matangatiwani, Pemba ...	53.47	99.37	78.96" 12 "

41. The distribution of the rainfall, moreover, was also unfortunate. Heavy rains in January made land preparation for rice extremely difficult, and such of the crop as was satisfactorily established had quite insufficient

rain during the important growing months of April and May. The vuli rains were very nearly a failure but the situation was to some extent saved by quite heavy falls in late December. Full meteorological details are given in the appendices at the end of the report.

PRINCIPAL CROPS

42. *Cloves*.—The clove crop appearing on the market for the seasonal year July, 1948, to June, 1949, was 13,743,482 lb. equivalent to 395,671 frasilas of 35 lb. each. This is about two-thirds of an average crop.

43. The percentage from Pemba was 79.20, as against 20.80 from Zanzibar. There was a small mwaka crop, which probably totalled about $1\frac{1}{4}$ lakhs of frasilas, and a small early vuli crop, the picking of which took place in late October and November. The harvesting of the main vuli crop did not start until well into December. In all, just under 1.7 lakhs of frasilas had passed through the market up to the end of the year.

44. Exports were 19,524,732 lb. only 2,780,068 lb. under the average exports for the preceding twenty years, and, as supplies were under 8,274,035 lb. merchants were "scraping the barrel" at the end of the year. In fact only the existence of "hidden" stocks in the town prevented the Protectorate from completely running out of cloves.

45. The Clove Growers Association purchased no buds during the year, but, with effect from the 1st March, the minimum percentage of buds to be supplied by the Association for every export consignment was raised from nil to $17\frac{1}{2}$ per cent.

46. The buying price of the Clove Growers Association for fair quality cloves was raised from Shs. 60 to Shs. 62 per 100 lb. as from 1st July, the buying price of all other grades, except mpeta, being increased in proportion. The Pemba differential was increased from Shs. 1/38 to Shs. 2/70 to meet increased costs.

47. The Association's selling price for buds was raised from Shs. 7 to Shs. 10 more than the buying price in order to provide an increased margin for expenses.

48. The Association's buying price for stems remained at Shs. 13/50 for commercial quality but, as a result of extremely poor distillation out-turns, was reduced to Shs. 10/50 for inferior.

49. The year opened with open market prices fluctuating within Shs. 2 each way of Shs. 70, and remained at this level until July, when the demand for buds for the Indian market, threatened with restriction if not temporary closure, drove the price to Shs. 77 in August. Subsequently shortage of buds caused fairly violent fluctuations between Shs. 80 and Shs. 90 or even higher, with at least one recorded price of Shs. 100 in September. The market closed at the end of the year at about Shs. 86.

50. Despite the cessation of licences for that destination during the last quarter of the year India, having purchased 8,987,845 lb. of cloves, was still by far our best single customer for the whole year, though the

percentage of our total exports taken fell to 46.05 per cent. The Straits Settlements were the next biggest buyer with 21.01 per cent, followed by the United States of America buying 9.27 per cent and the United Kingdom buying 7.73 per cent. All other destinations took 16.94 per cent which shows that there was a considerable increase in the volume of trade with our smaller customers.

51. Exports of clove oil were again rather lower at 318,362 lb., disposal being by means of *ad hoc* sales, with one standing order. Towards the end of the year the overseas demand increased very considerably.

52. *Coconuts*.—The coconut crop was probably an all time record, exports of the main products being as follows:—

	Exports tons	Copra equivalent tons
Copra ...	7,922	7,922
Coconut oil ...	6,539	10,898
Soap ...	381	381
	14,842	19,201

These figures rather flatter actual production as, whereas 1,696 tons of oil and 2,138 tons of copra were carried over from 1948, there was only the normal working carry over of perhaps 100 tons of oil between 1949 and 1950.

In addition 5,213 tons of oil-cake were exported.

53. The Ministry of Food's prices remained unchanged throughout the year, though negotiations regarding the 1950 contract were commenced in November. An export duty of 15 per cent *ad valorem* was imposed on copra, coconut oil and soap, as from 10th February.

54. Local copra prices in shillings and cents per 100 lb. varied during the year as follows:—

Quarter ending	F.M.	F.M.S.	B.S.D.
31st March ...	40.71—28.57	41.42—29.28	44.20—30.00
30th June ...	38.57—28.57	40.00—29.28	39.50—30.00
30th September ...	39.28—27.14	40.00—27.85	40.14—29.28
31st December ...	40.71—30.71	41.42—31.42	41.74—32.14

NOTE.—F.M. = Fair merchantable; F.M.S. = Fair merchantable sun-dried;
B.S.D. = Best sun-dried.

55. Prices were firm at the beginning and end of the year but sagged in the middle. The average price realised during the year for Government plantation copra was Shs. 37/59.

56. There was no export of mangrove bark as the forests were closed to cutting.

FOOD CROP PRODUCTION

57. As regards rice production 1949 was probably the most unfavourable year that has been encountered for a considerable time. Heavy rains early in the new year made preparation of rice land extremely difficult, and the partial failure of the masika seriously restricted the growth of such of the crop as had been successfully established. In Pemba hill rice failed almost completely, as did the rice planted in the drier situations in Zanzibar.

58. The following figures for estimated production well illustrate the results of these adverse conditions:—

<i>Estimated production of paddy in tons</i>						
		<i>Zanzibar</i>			<i>Pemba</i>	<i>Total</i>
1945	...	8,368	...	10,000	...	18,368
1946	...	3,618	...	5,000	...	8,618
1947	...	5,700	...	4,585	...	10,285
1948	...	9,780	...	6,365	...	16,145
1949	...	4,000	...	2,500	...	6,500

59. The rains in January ensured a fair crop from vuli planted cereals, but those planted prior to and at the beginning of the masika rains were almost a complete failure in Pemba, though a moderate crop of sorghum was harvested in parts of Zanzibar.

60. The usual cassava and sweet potato planting drives were very much intensified and, aided by good mchuu rains, a very considerable measure of success was achieved in both islands. It is not too much to say that these July and August rains made all the difference between the measure of scarcity that occurred and the serious situation that might well have arisen.

61. A new departure, in Zanzibar only, was a compulsory banana planting order, compelling all cultivators to plant a stated number of suckers in the vicinity of their houses. This was a great success, being obeyed without any recourse to prosecutions, and undoubtedly increased the reserve food supplies.

62. As usual, considerable quantities of planting material were either sold or supplied free to the public. Details are in Appendix III.

63. Comparative sales of foodstuffs in the Estella Market are as follows:—

		<i>Fish</i>		<i>Fruit</i>		<i>Vegetable</i>		<i>Staple starchy</i>
		<i>lb.</i>		<i>Pakachas</i>		<i>Pakachas</i>		<i>food</i>
								<i>Pakachas</i>
1945	...	208,162	...	39,021	...	48,654	...	77,675
1946	...	183,160	...	65,479	...	43,581	...	72,218
1947	...	194,245	...	29,140	...	43,343	...	67,795
1948	...	214,593	...	50,551	...	57,872	...	58,753
1949	...	261,323	...	69,943	...	49,001	...	86,297

64. Appendix IV gives particulars of the exports of all domestic products. The following comparison of export values over the past five years are of interest:—

	Percentage of total exports				
	1945	1946	1947	1948	1949
Cloves and clove bud and stem oil ...	68.57	73.15	58.60	74.99	43.87
Coconut products ...	24.98	16.81	33.18	19.52	52.63
Mangrove bark ...	5.02	8.14	4.73	1.71	—
Others ...	1.43	1.90	3.49	3.78	3.50

The greatly increased value of coconut as compared to clove products during 1949 is worthy of notice.

SECTION II.—WORK OF THE DEPARTMENT OF AGRICULTURE

GENERAL

65. *Staff*.—Mr. G. E. Tidbury acted as Senior Agricultural Officer until the return from leave of Mr. A. K. Briant on 20th May, 1949. Mr. G. W. Anderson went on six months' leave on 7th May. Mr. I. G. C. Squire, Manager of Plantations was on leave from 7th May until 9th December, 1949. During his absence Mr. J. Barrett acted as Manager of Plantations in addition to his duties as Manager of the Experimental Farm. Mr. K. A. Bowden was appointed Agricultural Development Officer on the 21st October, 1949, to replace Mr. D. W. Winter, Agricultural Officer, who was seconded to "Clove Control" as from 25th November, 1949. Mr. W. E. Calton, Government Chemist, proceeded on leave on the 19th November. Subsequently and until the end of the year Mr. A. K. Briant acted as Government Chemist. Mr. K. F. King was transferred from Aden to the newly created post of Fishery Officer and arrived in the Protectorate on 19th September.

The Director of Agriculture ceased to be Food Controller during the year.

66. *School gardens*.—This was the first year in which teachers trained in the "Young Farmers" course were able to put their training into practice in school gardens. A most unfavourable year made conditions very difficult, but in Pemba at any rate, and possibly at one or two places in the south of Zanzibar island, improvement was noticeable.

67. *Migombani Gardens*.—The Botanic Gardens at Migombani were maintained, and several new plants were introduced. Of the 6,814 plants grown for sale and distribution 1,385 were utilised by the Agricultural Department and 866 were sold to the public. The latter figure is 84 per cent greater than the number sold in 1947, and public interest in planting shrubs and trees appears to be slowly increasing. The extension of the garden by the acquisition (by exchange) of a piece of land adjoining the entrance

has been a great asset. Part of this land was levelled to form two bench terraces, and on these about 40,000 tree seedlings were established mainly for planting out in the new prison fuel reserve at Walezo-Chumbuni in 1950.

68. *Compost manufacture*.—Normal sales during the year totalled 386 tons and free issues 16 tons. In addition, 300 tons were sold at half price to the veterinary section for improving the quarantine pastures. Total disposals were therefore 702 tons as against 529 tons during the previous year.

69. *Copra Cess Board*.—As hitherto, the main activities of the Copra Cess Board were those of assisting to finance the raising of coconut seedlings and the repair and construction of coconut kilns. 125,000 seedlings were issued in Zanzibar and 3,442 in Pemba, these numbers being 76 per cent and 34 per cent respectively of the nuts planted in the nurseries. The heavy casualties were mainly due to poor germination and white ants.

Provision was made for the production of 220,000 seedlings in Zanzibar for 1950 planting, and 70,000 in Pemba. A new departure has been the raising of seedlings at clove nurseries to make them readily available in all areas.

With assistance from the Copra Cess Board and Government, copra producers constructed 213 new kilns in Zanzibar and 98 in Pemba, the effect on the general quality of copra being very marked.

A new and important project has been initiated by the decision to erect and operate a "Coconut Products Factory". The necessary plant has been ordered and erection will start during 1950.

70. The Agricultural Advisory Committees continued to do useful work, especially in ventilating unofficial opinion with regard to agricultural matters.

CLOVE REGENERATION

71. The following are details of seedling distribution during the year:—

		<i>Zanzibar</i>		<i>Pemba</i>		<i>Total</i>
Sold	...	34,799	...	32,306	...	67,105
Issued free	...	87,288	...	15,850	...	103,138
Not taken up	...	36,800	...	28,562	...	65,362
		158,887		76,718		235,605

Total distribution was thus 170,243 compared with 159,568 in 1948 and 223,478 in 1947. The continued low figure is due to a variety of causes, including "Sudden Death" uncertainty, the increased price of coconut products, and unfavourable planting conditions. In Pemba the closing of district roads was also a contributory factor. The number of nurseries was reduced by one in Zanzibar and two in Pemba.

72. Provision of seedlings for 1950 is as follows:—

	<i>Zanzibar</i>	<i>Pemba</i>	<i>Total</i>
Protectorate Funds ...	28,000	29,500	57,500
Colonial Development and Welfare free distribution ...	40,000	14,750	54,750
Clove Growers Association free distribution ...	17,000	14,750	31,750
	85,000	59,000	144,000

In addition to these many of the seedlings which were not taken up in 1949 will be available for distribution.

DISTRIBUTION OF PLANTS AND SEEDS

73. The importation of limited quantities of vegetable seeds for sale to the public continues and a certain amount of seed is produced at Kizimbani.

Considerable numbers of budded citrus plants, seedlings of other fruit trees, and other planting material ranging from ornamental shrubs to forest trees, were distributed from both Kizimbani in Zanzibar and Limbani in Pemba. A full list is given in Appendix IV.

AGRICULTURAL SHOWS

74. Agricultural Shows were held at Konde in Pemba on the 19th September and at Makunduchi in Zanzibar on the 28th November. Both were successful and largely attended by the public, that at Konde being especially popular. Prizes were given for a large number of live and dead classes and in general the quality of the exhibits, taking into consideration the novelty of the occasion, was good.

75. The following demonstrations were arranged by the Department of Agriculture:—

<i>Makunduchi</i>	<i>Konde</i>
(1) The soils of Zanzibar.	(1) The Soils of Pemba.
(2) Castration.	(2) Vegetable growing and an exhibit of vegetables.
(3) Trypanosomiasis.	(3) Derris cultivation.
(4) Curing of hides and skins.	(4) Copra production.
(5) Virus diseases in cassava.	(5) Citrus budding and demonstration.
(6) The utility of compost.	(6) Curing of hides and skins.
(7) Grades of coil tobacco.	(7) Cocoa growing.
(8) Copra production.	(8) Coffee growing.
	(9) Poultry husbandry.
	(10) Parboiling of rice.

The coil tobacco demonstration at Makunduchi was arranged with the co-operation of the Clove Growers Association.

76. In parenthesis it might be mentioned that at last people at Makunduchi are realising the value of compost and some six tons from the communal heaps were taken by cultivators.

GOVERNMENT PLANTATIONS

77. From the summarised statement, Appendix I, at the end of this report, it will be seen that the plantations showed a profit of Shs. 123,400/51 as compared with Shs. 22,338 in 1948, the next best being Shs. 72,960 in 1937 prior to the sale of two plantations. Last year's profit demonstrates the reasonably sound economic position of a good mixed shamba at present day prices. As a matter of interest, during the last 17 years, revenue has exceeded expenditure by a total of Shs. 283,040 or £14,152.

78. Appendix II analyses the position of the four plantation groups. Even the "Sudden Death" stricken Selem showed an operating profit, and 1950 should produce some small revenue from cocoa sales.

79. A year of exceptionally high yields resulted in 2,859,803 nuts being harvested and collected; a total of nearly 25 per cent above the average for the previous five years:—

Comparative figures are as follows:—

1944	1945	1946	1947	1948	1949
2,413,021	2,263,571	2,679,630	2,067,931	2,062,182	2,859,803

The number of nuts utilised to make one ton of copra was 6,540, the average for the last five years inclusive being 6,672.

80. During the year 3,021,695 nuts were dealt with as follows:—

Nuts			Nuts		
Brought forward ...	161,892		Husked for copra ...	2,518,611	
Gathered ...	2,843,032		Sold ...	323,755	
Collected by patrols	16,771		Rotten and unsaleable	15,354	
			Seed ...	2,000	
			Destroyed by fire ...	3,500	
			Carried forward ...	158,475	
		3,021,695			3,021,695

81. The average prices realised expressed in shillings and cents per 1,000 nuts during the past six years are as follows:—

1944	1945	1946	1947	1948	1949
40.85 ...	45.62 ...	55.37 ...	62.52 ...	105.70 ...	131.00

Copra made during the same period and the average prices realised are given below:—

	1944	1945	1946	1947	1948	1949
Tons of copra ...	306	343	287	269	264	382
Average price per						
ton in shillings	317.00	349.50	460.00	539.00	748.50	842.00

82. Cloves and stems harvested and the average prices realised per 100 lb. cloves during the past five seasons are as follows:—

		<i>Green cloves lb.</i>		<i>Dry cloves lb.</i>		<i>Dry stems lb.</i>		<i>Average price Dry cloves Shs.</i>
1945-46	...	3,747	...	1,185	...	342	...	51.25
1946-47	...	273,692	...	87,032	...	24,368	...	52.28
1947-48	...	11,202	...	3,691	...	1,048	...	47.04
1948-49	...	48,792	...	15,951	...	4,828	...	68.24
1949 (last six months)	...	110,020	...	35,592	...	10,160	...	80.02

The 1949-50 clove season was characterised by there being one mwaka and two separate vuli pickings.

83. Cocoa planting in the Government plantations can be summarised as follows:—

		1946	1947	1948	1949	Total
Selem (sakafu)	...	2,702	2,633	—	1,660	9,359
Selem (Mfenesini)	...	—	1,800	564		
Langoni	...	756	4,063	1,119		
					3,557	9,495

Actually 9,041 seedlings were planted in 1949 either as supplies or in new sites, but, owing to unfavourable weather conditions, casualties were very heavy.

84. There are now approximately 25 acres of cocoa at Selem and Langoni, some of this area being inter-planted with cloves. For the first time a small portion of the crop was fermented and is to be sent to the United Kingdom for report.

THE WORK OF THE EXPERIMENTAL STATIONS

85. With the acquisition of land for a small permanent crop demonstration plot at Mahaduthi in southern Pemba the full complement of units envisaged in the development programme has been attained. With the possible exception of one or two of the processing plants all capital works under Scheme D.647 should be completed by the end of 1950.

86. At Kizimbani new pupils' quarters were built from funds provided by the Protectorate.

87. Fertiliser trials again constituted the most important work undertaken during the year. (See Appendix VIII and paragraphs 133-160.)

88. The observational experiment, commenced at Muongoni to ascertain whether the burning of the secondary bush when clearing coral rag is an essential preliminary to cultivation, or whether it is merely a matter of convenience and economy of labour, was continued during the year.

The experiment consists of four plots. On two plots A1 and A2 the bush was burnt on the land, and on the other two B1 and B2 it was removed for making compost.

The yields in pounds per acre obtained from the plots to date are as follows:—

Crop	Maize	Cowpeas	Maize and gram		Sorghum
	Mar., 1948	Aug., 1948	Nov., 1948	Apr., 1949	
Planted	July, 1948	Oct., 1948	Feb., 1949	July, 1949	
Harvested					
A1\		*210	60	28	†332
A2\	144	93	—	32	120
B1\		*16	—	24	†72
B2\	54	20	—	24	†16

*Plots A1 and B1 dressed with artificials at following rates per acre:—

Sulphate of Ammonia	...	2 cwt.
Sodaphosphate	...	2 cwt.
Muriate of Potash	...	1 cwt.

†Plots A1 and B1 dressed with Sulphate of Ammonia at 1 cwt. per acre.

‡Original bush re-applied to plots B1 and B2 as compost, any unrotted materials being burnt and the ash applied.

The experiment strongly supports the view that burning is essential for successful cultivation. Opinions as to the reason for this are divided, one theory being that burning destroys organisms which would otherwise prey on nitrifying bacteria. The experiment also indicates that the use of sulphate of ammonia may prove economic on this type of soil.

KIZIMBANI EXPERIMENTAL STATION

89. *Cassava*.—In the variety trial of locally produced seedlings K91 and K85 were the best yielders giving between 10–11 tons per acre. The season was of course unfavourable for root crops. The 1948 “K” selections were harvested, and 14 out of the 220 again planted with the high yielding standard variety “Msitu” for comparison.

90. *Citrus*.—The recorded yield from the citrus orchard was higher than in 1948, oranges harvested totalling 88,058 with an average of 342 per tree, and grapefruit 8,410 with an average of 271 per tree.

91. *Cloves*.—In the trial of artificial manuring of clove saplings, sulphate of ammonia, sulphate of potash and sodaphosphate were applied at the usual rates, and the cover crop of *Pueraria phaseoloides* was maintained. The trees produced a fair crop for the second year in succession, the total yields of green cloves from 403 trees being 4,711 lb. in 1948, and 4,403 lb. in 1949.

92. The analysis of the 1949 yields indicates that during the past year sulphate of ammonia has had a significant depressing effect on yield, and that phosphates have had a highly significant depressing effect. In view of the effects of N and P on annual crops at Kizimbani the above depressing effects are most unexpected, and it seems probable that they have been produced by some indirect cause. Possibly the N and P absorbed by the cover crops and weeds stimulated them to greater vigour so that they became more

serious competitors of the clove for other plant requirements. In considering the yields and indications, however, it must be remembered that there is a tremendous variability in the bearing capacity and bearing habits of clove trees, and neighbouring trees do not necessarily all bear large or small crops in the same year.

The following table shows how the average yields of green cloves harvested per tree varied with the presence or absence of nitrogen and phosphate dressings. Each figure is the average of the potash and no potash plots:—

		No N		N		Mean
No P	...	13.1	...	12.8	...	12.95
P	...	11.3	...	6.6	...	8.95
Mean	...	12.2	...	9.7	...	10.95

A similar table to show the effects of nitrogen and potash, the yields being the average of the phosphate and no phosphate plots, is as follows:—

		No N		N		Mean
No K	...	12.3	...	10.1	...	11.2
K	...	12.1	...	9.3	...	10.7
Mean	...	12.2	...	9.7	...	10.95

93. The soil moisture experiment laid down in this experimental block by the Clove Research team indicates that the moisture requirements of "kudzu" are about the same as those of a grass cover. In such case, because of its general utility, there appears to be good reasons for its use as a row crop between cloves.

94. The clove trees in the Regeneration of Cloves under various nurse crops and shade trees bore a total of 744 lb. of green cloves. Although the average yield per tree for the various treatments varied from 3.36 lb. to 10.26 lb. there was no significant difference between the yields. The highest yields, as might be expected from the appearance of the trees, were obtained from the two series of plots having *Gliricidia* and bananas as the shade crops.

95. In the Long-Term Manurial trial in which coconut meal is applied at different rates to clove saplings, and in the Nitrogenous Manuring of Saplings experiment where different combinations of coconut meal and sulphate of ammonia are applied, the differences in yield between different treatments did not even approach significance.

96. *Cocoa*.—The 5-acre block of *Criollo* originally laid down at Kizimbani has continued to be something of an enigma. Permanent *Gliricidia* shade has been established and "kudzu" also planted as a soil cover. This latter has itself made very poor growth. Insect control has been by spraying and hand picking, but this does not strike at the root of the problem as it is only when the plants are unthrifty in the first place that insect damage becomes serious.

97. The Dunga plot bore a record crop of 2,643 pods, an average yield of 48 pods per tree. This continues to be our main source of seed supply, though some selection of individual trees for this purpose is now possible.

The six recorded trees in the *Forastero* block at Kinuni Moshi bore 1,150 pods against an average of 420 for the previous six years. Details are given in Appendix VI.

98. Three observation plots of *Criollo*, *Forastero* and *Bule* (*Criollo*) were established at different places in Zanzibar in order to study their respective behaviour when grown side by side.

99. *Shade tree experiment*.—Owing to the very poor growth of the temporary banana shade it was not possible to plant the cocoa during the year. Of the trees planted, *Melia azedarach*, *Cassia siamea*, and *Gliricidia maculata* seem the most promising.

100. Experiments on the raising of cocoa plants from chupon and fan cuttings in a propagator were again conducted on a small scale. The chupon cuttings were subjected to various treatments with Hortomone A. The best results were obtained by standing chupon cuttings in Hortomone Strength III for 24 hours before planting, when 8 out of 11 cuttings rooted. The total number of cuttings rooted amounted to 50. The chief reason for getting only a small percentage to root is probably the difficulty of admitting sufficient light to the propagators.

101. Five samples of cocoa were fermented for sending to the United Kingdom for a manufacturer's report. Owing to the small quantities of beans fermented difficulty was experienced in attaining normal fermentation temperatures, and the recommended period for *Criollo* had to be extended from 4 to 6 days.

102. *Coffee*.—Probably owing to the low rainfall the *Excelsa* block yielded very badly, but the *Liberica* seemed comparatively unaffected. Both new and old blocks of *Liberica* are doing very well, and *Pueraria phaseoloides* is proving an excellent cover crop.

The yields for the past eight years are shown below:—

Variety	No. of trees	Planted	Yields in pounds of fresh berries								
			1942	1943	1944	1945	1946	1947	1948	1949	
<i>Excelsa</i>	...	175	1939	116	380	278	952	889	972	3,211	772
<i>Liberica</i>	...	256	1928	568	962	320	868	2,130	355	2,775	2,112

103. *Derris*.—Half an acre was maintained to provide planting material, but there was very little demand. The 2-acre block planted in 1947 will be ready for harvesting after the 1950 masika.

104. *Kapok*.—Yields, which remained very low, were as follows:—

	Pounds per tree	
	Lint	Seed
Block A:		
Java via Saigon	...	2.21 ... 3.04
Block B:		
Saigon	...	1.87 ... 2.52
Block C:		
Mixed Java and F.M.S.	1.82	... 2.56
Block D:		
Selewak Sewengem	...	2.04 ... 2.12

The seed has now a definite commerical value. Half the recently planted local large-podded trees will be kept cut back to not more than 3 tiers of branches. This system, introduced by a local cultivator, appears to do little to reduce yield while greatly decreasing the cost of harvesting.

105. *Oil-palms*.—The dry year resulted in most disappointing oil yields, though the actual number of bunches harvested was a record. Detailed yields are shown in Appendix VII.

Three new types of seed obtained by crossing selected *Dura* mother trees with pollen from *Dura*, *Tenera* and *Pisifera* types have been received from the Oil-Palm Research Station in Nigeria and planted at Kizimbani and Limbani.

106. *Papaws*.—Owing to the tremendous fall in papain prices production has been temporarily discontinued. Two new varieties from Queensland, Bettina 102 and Peterson 120, were sown during the year.

107. *Pineapples*.—The usual stock plots of Smooth Cayenne and Californian Red were maintained.

108. *Pueraria phaseoloides* (*tropical kudzu*) remains the standard cover and fodder crop of the station and still retains all its early promise (*see* paragraph 93).

109. *Rice*.—The purifying and selection of high tillering plants of some of the higher yielding varieties at Kizimbani was continued. Two variety trials laid down at Kizimbani and Kisongoni to compare the yields of six semi-swamp rices gave no conclusive results. A small trial to compare Pemba varieties at Kisongoni also indicated no differences in yield. The yields in these experiments were all lower than usual owing to the poor rains experienced during the growing period.

110. *Sweet potatoes*.—There was a great demand for slips of B.44 and Caroline Lea, thousands of which were issued to cultivators. The Hong Kong varieties were harvested and tested for taste, texture, and yield. The seven best were again planted for further tests.

110. *Tetracarpium conophorum*.—Plants of this oil-seed producer are making the most prolific growth, but although they have flowered they have so far set no seed.

112. *Yams*.—Of the five varieties tested, Joka, Bottleneck Lisbon and Mondo were the best yielders, and these three have been replanted in an experiment which includes the application of farm-yard manure and compost.

ZANZIBAR EASTERN SEABOARD STATIONS

113. *Forest plots*.—The forest plots at Hanyegwa Mchana continued to make good progress, but up to date no tree has shown the rate of growth and general sturdiness of *Cassia siamea*. Time will show whether this tree will maintain its early promise or, as is half-expected, start to die back when five or six years old.

114. Additions to plots during the masika were *Chlorophora excelsa*, *Mangifera indica*, *Acacia auriculiformis*, *Sterculia alata*, and a locally obtained (Ndagaa) kapok. Of these *A. auriculiformis* is far the most promising. Vuli additions consisted of *Pithecolobium saman*, *Prosopis juliflora*, *Pterocarpus dalbergioides*, and *Sorindeia madagascariensis* (a local fuel tree).

115. Two regeneration experiments have been started, one at Hanyegwa Mchana and one at Muongoni. At the former station an area of $7\frac{1}{2}$ acres of exhausted land, divided into half-acre plots is being treated in various ways. In five of the plots *Cassia siamea*, *Sorindeia madagascariensis*, *Diospyros mespiliformis*, *Trema guineensis*, and *Pterocarpus indicus* have been established under cassava, and *Acacia auriculiformis* will be planted in a sixth plot. One half-acre plot has been planted with *Pueraria*, another with a species of *Digitaria*, and others left to natural grass.

116. At Muongoni line sowings were made of *Leucana glauca*, *Trema guineensis*, *Cassia siamea*, and *Diospyros mespiliformis*, and stakes of *Pterocarpus indicus* were planted. One plot has been planted with kudzu, one left to regenerate itself naturally and another will be planted with *Acacia auriculiformis* when seed is available.

117. The object of these comparatively long-term experiments is to see if the normal means of regeneration of exhausted land by allowing it to revert to bush, at present requiring 7-8 years for effective recovery, can be appreciably shortened.

118. *Bananas*.—The final yields of the six banana blocks planted in 1948 were as follows:—

Variety	Number of bunches per acre	Weight in pounds per acre	First bunch harvested	Last bunch harvested
Koroboi ...	400	2,600	June, 1948	April, 1949
Mkono wa tembo and Mzungu ...	164	1,216	Sept., 1948	April, 1949
Kipukusa ...	312	1,060	Sept., 1948	June, 1949
Kiguruwe ...	36	232	Sept., 1948	April, 1949
Ntwike ...	16	160	Oct., 1948	Feb., 1949
Mjenga ...	32	136	Nov., 1948	June, 1949

From these results, and similar experience at Muongoni it seems clear that bananas cannot fill a large-scale role in the utilisation of the uwanda but only serve as a useful addition to the food supply when planted in the best pockets of soil.

119. *Citrus*.—The citrus planted in a very stony site at Hanyegwa is doing extraordinarily well.

120. *Cassava*.—A half-acre plot planted in the 1948 masika yielded at the rate of 4,986 lb. per acre, a satisfactory result from a root crop in thin and stony soil.

121. *Chillies*.—Yields were 200 lb., 128 lb., and 90 lb. per acre at Hanyegwa, Muongoni, and Makunduchi, respectively. Growing conditions were bad. Chillie seedlings provided for the public were greatly in excess of the demand.

122. *Cotton*.—A small manurial trial yielded an average of 204 lb. of seed cotton per acre. Plot yields were as follows:—

3 cwt. sulphate of ammonia per acre, 272 lb. seed cotton per acre.

2 cwt. sulphate of ammonia per acre, 176 lb. seed cotton per acre.

1 cwt. sulphate of ammonia per acre, 176 lb. seed cotton per acre.

Control: No manure ... 192 lb. seed cotton per acre.

The rainfall was insufficient for optimum growth, but on the other hand stainer attack was less severe than in 1948.

123. *Groundnuts*.—The groundnuts planted in the vuli of 1948 yielded 466 lb. of dry undecorticated nuts per acre. A certain number of plants were killed by a wilt disease during the latter stages of growth.

124. *Pueraria phaseoloides* (tropical kudzu).—This legume will so far as can be seen, only do well on the coral derived kinongo soils provided that it is given a heavy initial dressing of farm-yard manure or compost and nitrogen.

125. *Simsim*.—Several trial sowings of both black and white simsim yielded the information that planting should not be later than July or early August. The best yield was 344 lb. of white simsim an acre from a plot sown on 22nd July.

126. *Sunflower*.—A manurial experiment on sunflower yielded an average of 438 lb. of seed per acre. This is a promising portent for the future when the most suitable variety, best time of planting, and optimum manurial treatment have been ascertained.

127. *Tobacco*.—Four improved varieties of tobacco suitable for air-drying were introduced with a view to producing a leaf suitable for cigarette tobacco. They yielded at the rate of the following pounds of cured leaf per acre:—

White-stemmed Orinoco	...	270 lb.
Nyasaland Western Heavy	...	336 „
Jamaica Wrapper		288 „
Amorello		60 „

Mosaic disease was prevalent but not very serious. So far as quality is concerned Amorello was placed first with Nyasaland Western Heavy second, but at the moment prices appear to be too low to encourage production, at any rate for the East African market.

128. *Stock*.—At Hanyegwa Mchana the main intention is to study the possibility of utilising the grassy uwanda plains for the production of "ranching" beef cattle. On the whole the stock did well in 1949, in spite of the severe conditions, and there are indications that the pasture is susceptible to improvement by grazing, management and possibly manuring.

PEMBA STATIONS

129. *Cacao*.—The "Bule" type trees at Matangatwani planted in 1946 produced a small "light" crop and quite a satisfying "main" crop towards the end of the year. The pod-types of the progeny from the two "Bule" trees have been differentiated as follows:—

Tree No. 2: Reddish, slightly yellow, 5 inches by 3 inches, apex pointed, smooth. Seeds in some cases with minute traces of purple. Usually 10-20 pods per tree.

Tree No. 3: Reddish yellow, small, round, smooth. Ridges not angled. Typical "Bule" *Porcelaino*. Seeds pure white. Up to 30 pods per tree.

Samples of fermented beans from both are to be prepared for report.

130. There appears to be some possibility of establishing a high-yielding strain with reasonably sized pods by crossing No. 3 with the ordinary "Dunga" *Criollo*.

131. *Rice*.—In spite of the drought 1,478 lb. of paddy to the acre were produced at Weni, probably one of the biggest yields in the island during 1949.

132. *Livestock*.—Small dairy herds are being established at all stations with a view to gradually building up fertility and in the hope that a good milking strain may be discovered.

FERTILIZER EXPERIMENTS

133. The results of manurial investigations carried out by the department during the last three years were followed up by the laying down of thirteen full-scale field experiments and a large number of microplot experiments. In 1949, however, the large-scale experiments were mostly laid down as part of a series of fertiliser trials conducted throughout East Africa under the auspices of the East African Agricultural and Forestry Research Organisation Fertiliser Scheme.

134. Eleven of these experiments were undertaken in Zanzibar island, and, so far as rice in Zanzibar is concerned, it is not too soon to make recommendations regarding dressings of artificials which will, in normal years, both increase yields and more than repay their own cost.

135. The Zanzibar experiments provided strong confirmation, firstly, that nitrogen and phosphate are in short supply on the *changa* soils, and, secondly, that nitrogen and probably potash are needed on the limestone derived *kinongo* soils. Most of the year's trials tested four levels of the appropriate fertilisers, and the more detailed analyses of the results given in Appendix VIII include an assessment of the cost of the fertilisers at all levels as compared with the value of the additional crop reaped.

136. Drought was the prevailing feature of 1949, and, on the whole, yields were low. This reduced the response to manurial dressings, and it may accordingly be assumed that the yield increases and economic returns as calculated are conservative estimates of what they would be in a "normal" year.

137. Certain crops did not show profitable responses. In some cases, such as cassava at Kizimbani, no increase in yield was shown by fertilisers. In other cases, such as in all Zanzibar maize experiments, the fertilisers caused considerable percentage increases in yield, but the overall level of production was so low that the extra yield was worth less than the cost of the fertiliser.

138. Rice, however, which is very rarely grown on *kinongo* soils, presented a very much more satisfactory picture and responded well to nitrogen and phosphate, in all cases profitably. The most striking results were obtained at Cheju, where the *namo* soils produce a good crop of rice even without fertilisers. Here a mixed dressing of 2 cwt. of sulphate of ammonia plus 4.6 cwt. of phosphate caused a yield increase of 520 lb. of paddy worth Shs. 181/65 over and above the cost of the manures.

139. On *kinongo* soils sulphate of ammonia on maize paid a net dividend of Shs. 175/20 per acre, while potash on sunflowers at Hanyegwa Mchana also showed a small profitable increase.

140. Two other Zanzibar experiments are worthy of comment. The first, at Kizimbani, showed that superphosphate, hitherto regarded as unsuitable for Zanzibar soils, was of more value than the sodaphosphate which produced such striking results in previous years. It is thought that earlier lack of success with superphosphate may have been due to its having been applied as a top dressing instead of at the time of planting. The second experiment, at Hanyegwa Mchana, gave a clear indication that at least one minor element is in sufficiently short supply to reduce crop yields on *uwanda* (or shallow *kinongo*) soils.

141. In Pemba a series of microplots were laid down which greatly clarified our knowledge of the soils of that island. These appear to behave on the whole like Zanzibar *changa* and *namo*, and show no signs of having a counterpart to Zanzibar *kinongo* soils.

142. Two large field experiments were also laid down in Pemba. One, on rice at Konde, produced no useful results owing to drought. The other, on maize at Ole, indicated striking responses to nitrogen and phosphate.

143. Much work remains to be done but there is already sufficient information available to support a recommendation that all cultivators growing rice in Zanzibar island should apply a dressing of 1-2 cwt. of sulphate of ammonia plus 3-5 cwt. of superphosphate per acre.

144. In estimating the economic possibilities of applying manures the following prices have been taken for produce and fertilisers:—

Produce: Maize, 17 cents per pound wholesale.

Sorghum, 30 cents per pound wholesale.

Rice, 21 cents per pound (the paddy equivalent of the current wholesale price of imported white rice).

Sunflower, 22 cents per pound.

Fertilisers: Sulphate of ammonia, Shs. 25/30 per cwt.

Sulphate of potash, Shs. 28/20 per cwt.

Superphosphate, Shs. 15/75 per cwt.

The actual phosphatic fertiliser used was sodaphosphate, and its price has been calculated in terms of 2.1 cwt. of sodaphosphate to 2.3 cwt. of superphosphate.

145. In examining the results in Appendix VIII it should be realised that the terms such as N', N'' and N''', have no relation to the amount of manure (N refers to nitrogenous manure) applied, but refer to the type of

response obtained from the manure. Thus, a significant value for one of these terms might indicate whether the response increases regularly in proportion to the quantity of manure applied, or whether the response to the large dressings is greater or smaller than would be expected from the increases due to the smaller dressings.

146. The different quantities of a manure applied are expressed by terms such as N_0 , N_1 , N_2 and N_3 in the case of a nitrogenous manure N_0 being no dressing and N_3 the heaviest dressing. The letter N in the above terms is replaced by P, K or L when reference is made to phosphates, potash or lime.

147. The letter P, however, is also used as an abbreviation for "probability". For example, " $P=.05$ " indicates that there is a twenty to one probability (and " $P=.01$ " that there is a hundred to one probability) that the result of the experiment referred to is not due to chance.

EXPERIMENTS ON ZANZIBAR ISLAND

148. *Maize on Changa Soil at Selem* (Appendix VIII-A).—The crop was a poor one, averaging 509 lb. to the acre only. There was, however, a clear response to nitrogen, which was statistically significant. This response was partially due to the superiority of N_3 and N_2 over the lower levels, and partly to the superiority of N_3 and N_0 over the intermediate levels.

A response to phosphate was also obtained, a curious feature being that yields fell at the P_2 level lower than at P_1 , though the highest yields were at P_3 .

Owing to the poor overall yield, all treatments were economically unsound except the P_1 dressing, which showed a profit of Shs. 15/75 per acre.

149. *Maize on Changa Soil at Kizimbani* (Appendix VIII-B).—Here again yields were low, averaging 863 lb. per acre only. There was a significant response to phosphate up to the level of P_2 , but P_3 fell slightly. Nitrogen on the other hand showed increased yields up to N_3 , but they were not quite of statistical significance.

It is interesting to note that, though the average yield of the P_3 plots was no higher than P_2 , yet when N_2 or N_3 was present the top phosphate levels did give substantially higher yields. This illustrates the typical nitrogen-phosphate interaction on *changa* soils, where responses to high level of phosphate depend to a greater extent on the nitrogen supply.

The low yields precluded a profitable return on the sulphate of ammonia alone, although phosphate at low levels was slightly profitable in the presence of nitrogen.

150. *Rice on Changa Soils at Kisongoni* (Appendix VIII-C).—The average was 1,320 lb. of paddy to the acre, which is rather below a medium crop. Both nitrogen and phosphate caused clear responses, though the highest level of nitrogen was just below N_2 , and P_3 was little better than P_2 . Certain reactions were also significant, one indicating a very high yield for the combination N_1 plus P_1 and another indicating a strong tendency for the lowest level of nitrogen to cause little response at high levels of phosphate.

Returns were profitable in every instance except in the case of N_3 alone. Good returns resulted from medium dressings of sulphate of ammonia and phosphate combined, the lowest dressing of each showing a net return of nearly Shs. 150 an acre. The highest levels of both manures, though showing a profit, were obviously comparatively uneconomic.

151. *Rice on Changa Soil at Mahonda* (Appendix VIII-D).—This was a much poorer crop, averaging only 710 lb. per acre, and consequently much less profitable.

There was a significant response to nitrogen though N_3 fell slightly below N_2 . Phosphate also gave a significant response, though the response was far from being in direct proportion to the quantity of phosphate applied.

The interaction between nitrogen and phosphate was almost statistically significant, and the results showed that large increases in yield from the heavier dressings of either fertiliser were realised only when the other was also present in adequate supply.

Economically all the nitrogen dressings and the lowest phosphate dressing were profitable. The most profitable return of Shs. 65/62 per acre was from both manures at the lowest level.

152. *Sorghum on Kinongo Soil at Makunduchi* (Appendix VIII-E).—In this experiment manures containing nitrogen and potash were applied because previous experiments had indicated that these two elements and not phosphate were likely to be shortest in supply.

A fair crop of 764 lb. per acre, in spite of severe drought conditions, showed a highly significant and progressive response to nitrogen. The potash response was much less and was not quite significant. None of the interactions between nitrogen and potash was significant and the response to the higher levels of nitrogen was not so dependent on the presence of potash as it was on the presence of phosphate on the *changa* soils.

Economically the sulphate of ammonia was very profitable, the N_3 dressing showing a net profit of Shs. 175/20 per acre.

Applications of potash caused a loss in every case.

153. *Maize on Kinongo Soil at Mkwajuni* (Appendix VIII-F).—By an unfortunate error the maize was mixed on the drying floor before weighing the separate plot yields and only a cob count is available.

Cob numbers indicate a response to nitrogen but not to potash. Certain interactions between nitrogen and potash were quite considerable though statistically insignificant. It is probable that grain weight would have produced more significant results.

154. *Rice on Namo Soil at Cheju* (Appendix VIII-G).—*Namo* soils are heavy soils with a considerable capacity for retaining moisture. They are excellent rice soils and as might be expected both yields and profits were higher. The average yield of the experiment was at the rate of 1,843 lb. of paddy per acre though some plots yielded as much as 2,800 lb. per acre.

Nitrogen gave significant increases though N_3 showed little improvement over N_2 except in the presence of the highest phosphate dressing.

Phosphate produced very significantly higher yields than the control, though there was little to choose between any of the levels even in the presence of nitrogen.

Economically all dressings were profitable, the best profit for nitrogen being Shs. 159/40 at N_2 level, and for phosphate Shs. 147/62 at P_1 level. The N_2P_2 combination showed a profit of Shs. 181/65 per acre.

155. *Sunflowers on Kinongo (Uwanda) Soil at Hanyegwa Mchana* (Appendix VIII-H).—This experiment was designed to test the effect of nitrogen, phosphate, and potash, each at two levels, on sunflowers on *uwanda* soil.

Nitrogen and potash gave striking results, especially the latter, but the effects of phosphate were not significant. There was also an indication that both nitrogen and phosphate gave higher yields only in the presence of potash.

The importance of potash on *uwanda* soil is of great interest, as *uwanda* is thought to be an earlier stage of *kinongo* which is known to respond to potash.

The increases caused by nitrogen and phosphate were not economic, but potash applications produced small profits.

156. *Minor Elements Trial on Maize at Hanyegwa Mchana* (Appendix VIII-I).—It has been thought for some time that *uwanda* soils are deficient in one or more trace elements, due possibly to the abundance of lime. In 1948 experiments indicated that sorghum responded favourably to a mixture of minor elements, and that chlorosis of certain plants was ameliorated by spraying with ferrous sulphate.

This year's trial tested nine minor elements in groups of three thus:—

- A. Iron, manganese, copper.
- B. Magnesium, boron, zinc.
- C. Nickel, cobalt, and molybdenum.

All plots were split for nitrogen, which increased yield but did not enter into any obvious interactions.

The "A" mixture caused a significant increase in yield of 141 lb. per acre. The "B" mixture caused a significant decrease of 116 lb. per acre. The effect of the "C" mixture was not significant. Investigations will continue next year.

157. *Types of Phosphate Trial on Changa soil at Kizimbani* (Appendix VIII-J).—It has been thought that ordinary superphosphate produced no responses on these soils, possibly owing to its acid nature, and that phosphate needs could only be supplied by the basic sodaphosphate. This experiment was designed to test the truth of this belief and also to test triple phosphate and Latham Island guano.

All fertilisers were applied at rates calculated to supply 0.2 cwt. per acre of the element phosphorus and all plots were split for sulphate of ammonia.

The results indicated that all types increased yield significantly over control, but that superphosphate was more effective than sodaphosphate, and sodaphosphate than triple or guano.

158. *Cassava on Changa Soil at Kizimbani* (Appendix VIII-K).—Although cassava responds to manuring by an increase in aerial vegetative growth it has not yet been found at Kizimbani to respond in terms of increased weight of roots.

This year's trial was of sulphate of ammonia, sulphate of potash, and sodaphosphate, applied at 2 and 4 cwt. per acre, but there was no statistical difference between the yields.

EXPERIMENTS ON PEMBA ISLAND

159. *Maize on Kinako Soil at Ole* (Appendix VIII-L).—This was originally planted to rice, which failed and was replaced by maize under rapidly drying conditions.

Both nitrogen and phosphate caused highly significant increases in yield and significant negative interactions were observed between phosphate and potash and phosphate and lime.

This soil showed the need for lime last year in a rice experiment and the phosphate $\times$ lime interaction is understandable. The effect of potash is not very clear but its presence apparently decreases the effectiveness of small dressings of phosphate.

160. *Rice on Mtifutifu Soil at Konde* (Appendix VIII-M).—The severe drought precluded normal growth of rice and, though a small crop was reaped, the differences between plot yields were not statistically significant.

PASTURE IMPROVEMENT

161. Much of our work is now centred on the local *Digitaria* species, probably *D. eriantha*, which appears to comprise three or more variable forms with distinctive habits of growth. These have been successfully established under widely differing conditions of rainfall and soil.

162. Among introduced grasses which have shown promise can be numbered *Chloris gayana* (Rhodes Grass), which has done well at Kizimbani. This is a prolific seeder but it is doubtful at present whether the seed is viable. *Paspalum notatum* also does well in places, but needs moist growing conditions. Molasses grass can be grazed or cut, but still seems to have most future as a fodder.

163. Another imported grass, *Cenchrus ciliaris*, has done well under arid conditions prevailing at Hanyegwa Mchana. It produces abundant seed, and has reproduced itself in the neighbourhood of the plots, but it is believed that the proportion of viable seed is small.

164. The diversity of opinion regarding *Stenotaphrum dimidiatum* (Pemba Grass) still persists. It is unquestionably excellent for resisting erosion and consolidating banks and bunds, but its grazing qualities have been open to much doubt. It has, however, been the only grass really to

stand up to grazing and treading during the exceptionally dry conditions of 1949, and stock certainly do eat it, even though it may be because there is nothing else available.

165. *Pueraria phaseoloides* (tropical kudzu) is still the main fodder crop, though Elephant grass and Guinea grass both do well if manured.

166. A manurial experiment on natural pasture at Kizimbani gave the following results:—

Manure		Dressings		Cow hours grazing per acre during the year
F.Y.M.	...	5 tons	per acre	... 3,430
F.Y.M.	...	10 tons	per acre	... 4,066
N.	...	3 cwt.	per acre	... 2,590
N.	...	4½ cwt.	per acre	... 3,245
N.P.	...	3 cwt.	each per acre	... 2,937
N.P.	...	4½ cwt.	each per acre	... 2,771
N.P.K.	...	3 cwt.	each per acre	... 2,695
N.P.K.	...	4½ cwt.	each per acre	... 3,357
Control	...	No manure		... 1,817

167. Owing to lack of rain the manures could not be applied again during the vuli and the experiment will be continued.

168. It is evident that, besides fencing, either the cutting of weeds or the same function served by grazing goats together with cattle will be an essential concomitant of successful pasture management.

EDUCATION

169. *Young Farmers' Course*.—The second Young Farmers' Course was taken by five primary school teachers and six farmers' sons, two from Zanzibar and four from Pemba. The latter were older than the 1948 entry, but the general level of interest and enthusiasm was still disappointing. The teachers, on the other hand, all appeared to benefit from the course.

170. *Pupils-in-training*.—The school consisted of two Standard VIII pupils who were re-admitted to the third year course after a year's district work, two Standard VIII pupils in their second year, and three Standard XII pupils doing the first year of a course reduced to two years instead of three as formerly.

The wisdom of raising the entrance qualification to Standard XII as compared with Standard VIII has been amply justified by the much greater ease experienced in teaching scientific subjects.

171. *Rural Middle School Boys*.—The teaching of a limited amount of theoretical and practical agriculture to boys from the Khalifa Schools continued, though they now have to be conveyed between six and seven miles to and from the place of instruction. The scheme continues to be a great success.

172. The Kichwele small holders scheme has unfortunately dissolved itself by virtue of the majority of the settlers leaving their holdings and seeking other employment. The denouement, though to be regretted, has not in any way come as a startling surprise, and illustrates the difficulty of getting partly urbanised and sophisticated individuals to settle down happily under rural conditions.

VETERINARY AND ANIMAL HUSBANDRY.

173. Epidemic diseases were confined to a short outbreak of canine distemper in Pemba and a serious outbreak of contagious bovine pleuropneumonia at the Mtoni dairies.

174. The latter outbreak, which was introduced by a herd of milch cows from Kenya, imported in December, 1948, did not actually make its appearance at Mtoni dairies until February, 1949. All infected and suspected cattle were slaughtered, and all in-contacts inoculated. In addition all the Mtoni dairy stock and all other dairy cattle within a three-mile radius of the town were given a course of three inoculations. As deaths continued all Mtoni cattle were inoculated in December with a more potent vaccine. The worst infected herd was still segregated at the end of the year.

175. The total mortality up to the end of the year was 12 from deaths, and 29 from compulsory slaughter. *Ex gratia* compensation was paid for the latter.

176. *Trypanosomiasis*.—Routine examination of suspected animals and treatment of those infected was continued. Dimidium bromide was used for the first eight months but latterly a number of cases were treated with antrycide methyl-sulphate, with good results. Experiments at Pete show that antrycide sulphate is a very efficient curative and that it apparently affords some degree of protection against reinfection for 40–60 days after inoculation. Experiments with the antrycide sulphate/chloride mixture are to be conducted in 1950.

177. In 1949 a total of 478 animals were treated in Zanzibar island compared with 461 in 1948. This latter figure represents 7.2 per cent of the total cattle population of the island, but the percentage actually infected is considerably higher, as by no means all animals are brought in for treatment.

178. The mass blood-smear examinations carried out in 1948 were, with one or two exceptions, discontinued in 1949, it being left to owners to bring in their own animals for examination. Of the 2,547 cattle examined in country districts, 325 found to be infected with trypanosomiasis were immediately treated.

The response to the offer of treatment has on the whole been pleasing, except in the Mangapwani and Fumba peninsula areas, where the people remember deaths from K.A.G. virus in 1945.

The Veterinary Officer is strongly of the opinion that the small cattle population in Zanzibar as compared with Pemba is almost entirely due to trypanosomiasis.

179. *East Coast Fever and Dipping*.—In February the Mazizini dip, the first of those constructed under the development programme, was opened, and was most successful, most of the cattle coming to be dipped belonging to Indians, Goans, and Wanyamwezi from the mainland. Kombeni dip, five miles further south, where most of those concerned are local Africans, has been an equally complete failure. The reasons are diverse, but are mainly centred round the innate conservatism and obstinacy of the uneducated African, coupled with the fact that they are not a traditional cattle-owning people and are not particularly interested in the welfare of their cattle.

180. Dips have also been constructed at Kibonde Mzungu, Mwera, Bweleo, and Hanyegwa Mchana, the last two mentioned being in the coral rag areas. None of these have as yet been put into commission except Hanyegwa Mchana, where, up to the time that the Kombeni influence was felt there was an appreciable amount of voluntary dipping.

181. In Pemba, dips were constructed at Ole and Vitongoji and opened towards the end of the year. They are fairly successful. In this connection it should be mentioned that the Pemba tick population is much greater than in Zanzibar and the incidence of East Coast Fever higher.

182. *Anthrax*.—One small outbreak occurred in goats imported from Tanganyika. One died in the slaughter-house and two at Mpigaduri. All necessary precautions were taken and no further deaths occurred. Arrangements have now been made with the Tanganyika Veterinary authorities to have all goats inoculated with anthrax vaccine and detained under observation prior to shipping.

183. Further improvements have been carried out to roads and fences in the Mtoni dairies and a new byre was nearly completed by the end of the year. Apart from the outbreak of pleuro-pneumonia the health of the stock remained good. The high calf mortality has been somewhat reduced, and cattle-owners are showing welcome signs of being willing to co-operate.

184. The hide and skin-drying shed, previously leased, was in September taken over by the Veterinary section. The majority of skins have been frame-dried in the shed but, on the whole, butchers continue to prefer to dry-salt their hides.

185. Pathological examinations at the Veterinary clinic during the year were as follows:—

Bovines	...	...	...	2,065
Other mammals	...	...	...	110
Birds	...	...	...	5

Treatments during the year were as under:—

	Zanzibar	Pemba
Bovines	1,428	870
Other mammals	355	
Birds	473	

In addition 232 young bulls were castrated in Pemba.

186. Comparative importations into Zanzibar from the mainland and elsewhere, including Pemba, for the years 1946 to 1949, are as follows:—

	1946	1947	1948	1949
Oxen ...	2,177	2,370	1,954	2,250
Cows ...	177	262	157	191
Calves ...	72	99	76	56
Goats ...	9,490	11,669	10,432	10,717
Sheep ...	1,215	1,664	1,304	1,650
Donkeys ...	46	101	44	90
Horses ...	3	3	1	—
Mules ...	—	—	—	1

Again there is little to be said except that purchasing power has been well maintained and even slightly increased.

187. Animals slaughtered at the Zanzibar abattoir during the year were as follows:—

	Oxen	Cows	Calves	Goats	Sheep
Imported ...	1,769	—	—	9,170	1,369
Local ...	459	74	70	1,974	—
Pemba ...	97	16	—	—	—
	2,325	90	70	11,144	1,369

Total slaughtering are very slightly less than for 1948, but those of local stock very substantially so.

188. Pemba slaughtering of bovines were as follows:—

	Konde	Wete/Piki	Ziwani	Chake/ Chonga	Mkoani	Total
District ...	295	463	265	480	360	1,863
Township ...	—	458	—	311	79	848
	295	921	265	791	439	2,711

These figures are nearly 25 per cent below those of 1948. Probably the poor clove crop and cessation of the mangrove bark trade has something to do with this.

189. In addition the following goats were slaughtered in townships:—

Wete: 289 Chake: 46 Mkoani: 27

Tuberculosis Investigation

190. Mr. A. E. G. Markham, Veterinary Research Officer, East African Veterinary Research Organisation, visited Zanzibar on two occasions, on the first accompanied by Dr. E. G. White, to conduct an investigation into the incidence of tuberculosis in dairy cattle. The single comparative intradermal tuberculin test was employed, using Weybridge P.P.D.

191. The results may briefly be recorded as follows:—

Place	Positive reactors to mammalian tuberculin.		Doubtful reactors to mammalian tuberculin.		Positive reactors to avian tuberculin.	
	Per cent		Per cent		Per cent	
Kizimbani ...	$\frac{1}{2}$	...	$3\frac{1}{2}$	...	20	
Mtoni dairies ...	$2\frac{3}{4}$	...	$2\frac{3}{4}$	...	$41\frac{1}{2}$	

Retests at the Mtoni dairies of all positive and doubtful reactors gave the following results:—

Number of mammalian reactors tested	Number of avian reactors tested	Positive mammalian	Doubtful mammalian	Positive avian
8	60	1	1	18

192. The Kizimbani avian figure corresponds very closely to that for Zebu cattle on the mainland, and that for Mtoni compares quite favourably with grade herds on the coast.

These figures support the theory that non-specific reaction is inherent in the local Zebu stock and does not bear any relation to the reaction to mammalian tuberculin.

193. The Mtoni mammalian figures are low and also noticeably better than those obtained in 1943. Taking into consideration that during the year one beast at Mtoni was found with generalised tuberculosis, this is an indication that tuberculosis is not inclined to spread under Mtoni conditions.

194. Avian tuberculosis is not communicable to man and the figures for mammalian are not in any way disturbing, though ultimate eradication is of course desirable.

Tsetse Investigation

195. During the year an investigation into the incidence, breeding, and movement habits of *G. austeni* has been carried out by Mr. D. L. Johns, a Research Officer posted to Zanzibar for this purpose by the East African Tsetse Research Organisation.

196. Catches with bait oxen have indicated that *G. austeni* is found over most of Zanzibar, but with its main foci in bush and forest, the more especially in the neighbourhood of Jozani forest.

197. In the western part of the island the incidence is generally low, but it is here that the most damage is done, as game is scarce and cattle are the only available food supply. Conversely, on the eastern side of the island the incidence is usually higher, but less damage is done, as cattle are fewer and there is more game.

198. Preliminary indications are that large catches are to be expected in the typical "home" habitat in April and May, July and November. The first two periods, when there is a good deal of dispersal, coincide with the masika and mwaka rains. The high catches in the last period may be due to lack of dispersion, owing to the failure of the vuli rains causing increasingly adverse weather conditions.

199. In comparatively open areas activity tends to be restricted to the cooler portions of the day. As previous work has shown, the fly is not fond of moving in open spaces. The greatest distance recorded in Zanzibar is one mile in 47 days, this not being over open ground.

STOCK FARM

200. *Cattle*.—At the end of the year the cattle at the Kizimbani Stock Farm consisted of the following animals:—

Bulls	...	...	...	4
Young bulls	...	...	...	4
Cows	...	...	...	62
Heifers	...	...	...	42
Bull calves	...	...	...	15
Heifer calves	...	...	...	40
Bullocks	...	...	...	56
				223

201. As in 1948 all cows giving less than 175 gallons in their second lactation were culled, and in addition a number of young bullocks were drafted to the *Uwanda* station at Hanyegwa Mchana for grazing experiments.

202. The rearing of calves in movable pens has proved most satisfactory, and the mortality rate fell still further to 5.48 per cent. In all 73 calves were born. Apart from normal digestive complaints, there were four cases of acute dysentery from a salmoniella infection, one case of navel ill, and one of suspected redwater.

203. On the whole the main herd has been very free from serious disease, and only one case of East Coast Fever occurred. This is probably largely due to the fact that many of the local cattle have been regularly dipped.

204. The incidence of trypanosomiasis also fell from an average of two a month to a total of five in all. This is not so easy to explain unless the anti-trypanosomiasis campaign has reduced the number of cattle which provide reservoirs of infections.

205. Cowpox variola has been a constant source of trouble and in one case led to the enforced culling of a good cow owing to the loss of two quarters from exterior infection. In all 32 cases were confirmed. There were only three cases of suspected mastitis. All suspected cases are now immediately treated with 30,000 units of penicillin ointment.

206. Bulls Nos. 83 and 188 completed their fifty services during the year. A further bull was imported from Kenya and brought into the herd as stud-bull in September. Unfortunately it is becoming increasingly evident that No. 11 was useless as a transmitter of milking characteristics and No. 83, the only surviving son of No. 12, will be brought back when the Kenya bull has finished. A further importation is to be considered.

207. The monthly milk indices are tending to show a more constant annual variation in relation to the seasons and weather. They again show a small improvement over 1948.

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Average
1942-46	...	6.6	6.3	6.3	5.9	5.7	5.6	5.7	5.5	6.1	6.4	6.8	6.2
1947	...	5.1	5.1	5.2	5.2	5.6	6.2	6.3	6.5	6.9	7.1	6.8	6.1
1948	...	7.5	6.7	6.7	6.4	7.4	7.5	7.2	7.1	6.8	6.4	6.6	6.9
1949	...	6.7	7.0	7.0	8.2	7.5	7.4	7.5	7.4	7.1	6.7	6.8	7.2

208. The best yield of the year was 3,151 lb. in 288 days by cow No. 95 in her fourth lactation, with a milk index of 10.9. Four cows gave over 2,500 lb. One heifer gave 2,321 lb. in her first lactation. Appendix IX gives the comparative figures for milk production for the past eight years.

PRODUCE INSPECTION

209. The quantity of cloves passed for export, under the Agricultural Produce Export Decree, is shown below, the figures being in bales:—

Month	Grade II	Grade III	Total passed
January	...	110	155
February	...	3,684	60
March	...	1,086	—
April	...	964	—
May	...	11,465	—
June	...	1,618	—
July	...	3,227	—
August	...	39,491	400
September	...	19,103	—
October	...	5,548	—
November	...	5,126	—
December	...	11,832	400
	103,254	1,015	104,269

210. The percentage of Grade III cloves was just under 1 per cent. Packing was carried out in the Inspection Shed except in the case of two urgent shipments, for which No. 5 Godown was utilised. The largest of these, in August, prior to the re-introduction of licences for imports to India, on which occasion 10,925 bales were shipped to Mombasa on H.M.S. *Al-Said*, presented a scene without precedent in the history of Zanzibar.

211. The result of the examination of cloves and clove-stems under the Adulteration of Produce Decree were as follows:—

Origin	Cloves in Bags		Failed for			
	Total deliveries	Passed	Excessive moisture	Extraneous matter	Percentage of failure	
Zanzibar	... 16,964	... 16,085	... 378	... 501	... 5	
Pemba	... 58,858	... 54,657	... 2,978	... 1,223	... 7	
Total	... 75,822	70,742	3,356	1,724	6.7	

Origin	Clove-stems in Bags		Failed for			
	Total deliveries	Passed	Excessive moisture	Extraneous matter	Percentage of failure	
Zanzibar	... 7,346	6,936	82	328	6	
Pemba	... 16,336	14,822	1,514		9	
Total	... 23,682	21,758	1,924		8.1	

212. The following are details of the bags of copra which passed through the Zanzibar Market during the year and were examined for adulteration:—

Origin	Copra in Bags		Failed for			
	Total deliveries	Passed	Excessive moisture	Extraneous matter	Percentage of failure	
Zanzibar	... 220,092	... 213,787	... 5,665	... 640	... 3	
Pemba	... 92,884	... 92,821	... 48	... 15	...	
Total	... 312,976	306,608	5,713	655	3.8	

In addition the following copra was examined in Pemba, but it must be remembered that this largely overlaps the Pemba copra examined in Zanzibar:—

Total deliveries	Copra in Bags		Failed for			
	Passed	Excessive moisture	Extraneous matter	Percentage of failure		
101,991	... 89,217	... 12,774	...	12.5		

The small amount of Pemba copra which failed on subsequent inspection in Zanzibar is a measure of the efficiency of the Pemba inspection.

213. As from 1st October, 1949, copra was at last brought under the Agricultural Produce Export Decree, and standards set for both F.M. and F.M.S. Owing to the demand from millers no copra has actually been exported since that date.

214. 6,439 tons of coconut oil, or more exactly, 14,423,998 lb. were exported during the year. This was produced by eleven expellers, and the number of these is still increasing.

The quality of Zanzibar oil is understood to have been the subject of favourable comment from the trade in the United Kingdom.

Comparative exports are as follows:—

				lb.
1946	...	...	...	1,357,641
1947	...	...	...	2,344,945
1948	...	...	...	7,077,816
1949	...	...	...	14,423,998

215. As in 1948 nearly 16 tons of chillies were passed for export. There were no shipments of mangrove bark during the year.

216. Comparative produce arrivals for the past five years are as follows:—

	1945	1946	1947	1948	1949
	Bags	Bags	Bags	Bags	Bags
Zanzibar cloves	25,879	18,680	41,107	24,687	16,964
Pemba cloves	76,916	197,100	171,912	126,295	58,858
Zanzibar copra	159,634	159,315	131,872	152,996	220,092
Pemba copra	62,894	47,591	48,953	36,412	92,884
Zanzibar stems	16,199	4,082	28,839	8,077	7,346
Pemba stems	46,328	56,081	128,033	59,930	16,336
(Pemba inspection figures)					

CHEMICAL LABORATORY

217. Comparative figures for routine samples examined during the past ten years are as follows:—

	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949
Number of samples	391	1,085	2,458	1,779	1,338	931	975	933	1,185	1,876

Of the 1,876 samples examined during the year, 1,856 came from Government departments, and 20 from private firms. The reduction in work caused by the discontinuance of cattle dip analyses, now carried out by the Veterinary staff, was more than offset by the increase in samples of coconut oil and milk.

Fees during the year, excluding those paid for coconut oil, were Shs. 222/50 as against Shs. 278 in 1948. Those in respect of coconut oil, collected by the Inspector of Produce, were Shs. 16,204.

218. Details of Government samples were as follows:—

Agriculture.—Clove oil 33; clove-stems 1; cloves 1; coconut oil (export) 1,210; coconut oil (retail) 4; coconut husks 16; copra 72; copra (Makaroma) 1; compost 4; phosphatic fertilisers 2; lime 1; artificial manure 1; cattle dip 92.

Health Office.—Milk 244; condensed milk 8; tinned butter 2; ghee 1; tinned apples 3; water 6.

Police.—Bhang 26; opium 6; blood-stains 4; glass exhibits 6; gum exhibits 4; medicine 3.

Medical.—Coconut oil 1; rectified spirits 1; vomit 2; viscera 1; medicine 1; stomach contents 2; urine 2; stool 1.

Public Works Department.—Oil 1; water 58.

Others.—Town Mudir, fruit 14; Clove Research, water 3; Central Prison, coconut oil 1; Customs, aniline 1; and methylated spirits 1.

219. The quality of bud and stem oil from the Clove Growers Association remained good throughout the year. Of 1,210 samples of coconut oil examined 40 failed to comply with the required standards, mainly owing to excess of free fatty acid.

220. One-quarter of the milk samples examined were found to contain added water, of which one sample contained 64 per cent. All the adulterated samples came from outlying districts such as Makunduchi and Mkokotoni. Fines subsequently imposed ranged from Shs. 5 to Shs. 120.

Investigational Work

221. *Soil deficiencies.*—Investigations into possible soil deficiencies, especially in relation to the cause of unthriftiness of some of the cocoa at Kizimbani, were continued. The analyses of Kizimbani soils did not throw much light on the problem and all the major plant nutrients appeared to be adequate. Two new techniques were applied to the Kizimbani cocoa plot with considerable success. The first of these is tissue analysis, by which means it was established that the leaves of unthrifty cocoa are deficient in magnesium when compared with leaves of cocoa in a flourishing condition. The second technique applied was that of plant injection. After considerable setbacks in finding the right stages at which to inject, and the appropriate concentrations of solutions to use, it was established that the Kizimbani cocoa will respond to injections of magnesium, iron and copper. The first two give chlorophyll responses, while copper causes increased growth. The best response is obtained when all three elements are injected together. Iron or magnesium deficiency, or both, appears to make the trees at Kizimbani unduly liable to sun-scorch.

222. The examination of various top soils under cocoa for exchangeable magnesium indicated no clear relationship between soil magnesium and cocoa productivity. At Kizimbani the upper soil profile is better supplied with magnesium than at Selem where no magnesium deficiency is apparent. Magnesium deficiency at Kizimbani therefore seems to be due not directly to a soil deficiency but to a limitation by, perhaps, some soil property, of the plant's capacity to absorb sufficient magnesium.

223. The work with cashew seedlings in pots of various types of soil was continued. Ferrous sulphate, prepared from almost pure iron wire, was applied alone and in combination with manganese, cobalt, copper and zinc to a chlorotic leaf of a plant grown in a sandy *changa* soil from Selem. A marked response was obtained to iron plus cobalt, and a slight response to iron plus manganese, but no detectable response was shown to iron

alone or in combination with copper or zinc. The response faded progressively and black necrotic spots spread into the treated areas except where cobalt had been applied. A similar suggestion that cobalt controls necrosis was obtained on a cashew seedling growing in a *kinongo* soil.

Trees grown in and near the Victoria Gardens have been much improved by spraying and injecting with iron.

224. The role of manganese is interesting because a high manganese soil content may induce iron deficiency just as excess lime may do. Determinations of the manganese content of about 30 Zanzibar soils so far suggest that the shallow *kinongo* soils may be deficient in manganese, while the *changa* soils, particularly at Kizimbani, may contain manganese in excess.

225. *Soils suitable for Cocoa*.—Literature on the suitability of soils for cocoa is very vague and amounts to little more than recommending the avoidance of difficulties such as water-logging, desiccation and restricted root room. The Trinidad workers have, however, worked out the limits of adequacy of some soil constituents for cocoa under Trinidad conditions. It has been found that the limits do not fit Zanzibar conditions well, as some of the most promising cocoa is growing on soils on the borderline of adequacy while other soils, apparently suitable, grow very indifferent cocoa. No doubt a close relationship between soil series and cocoa productivity could be worked out, but until more is known about the soil series, suitability for cocoa planting can best be judged by the soil type. The general relation of cocoa productivity to soil type; discounting local soil impoverishment, and the effects of bad planting and neglect, appears to be as follows:—

Kinongo group:

Deeper <i>kinongo</i>	... suitable.
Shallower <i>kinongo</i>	... unsuitable.
<i>Wanda</i>	... unsuitable.
<i>Maweni</i>	... unsuitable.

Changa group:

Reddish <i>changa</i>	... suitable.
Brownish <i>changa</i>	... very suitable.
Yellow <i>changa</i>	... doubtful.
Grey <i>changa</i>	... unsuitable.
Sandy <i>changa</i>	... suitable if not too dry.

Namo group:

Brownish <i>namo</i>	... suitable.
Greyish <i>namo</i>	... unsuitable.

226. *Fruit Investigation*.—It is often the custom in Zanzibar to hasten the ripening of fruit before taking it to the market by putting unripe fruit into a hot pit. These fruits are markedly deficient in normal fruity taste and smell, and decay quickly. Laboratory examinations for acidity, sucrose, and esters showed no marked difference in these constituents between naturally ripened and fire-ripened samples of banana, mango, papaw,

and pineapples. Though there was an inverse relation between acidity and sucrose, the fire-ripened samples were not consistently more acid than the naturally ripe ones. An examination of the mangoes, papaws and bananas for Vitamin C, however, showed that fire-ripening had appreciably reduced the Vitamin C content of the two former fruits.

227. *Pemba Soils*.—During a stay in Pemba lasting three months, the Government Chemist carried out a reconnaissance survey of Pemba island, from which he drew up a working classification of the existing soil types and their distribution. Some of the Pemba soil types, particularly *Utasi* and *Ndamba*, are not found in Zanzibar, and certain Zanzibar soil series, for example, the *Kinongo*, are not found in Pemba. The Pemba soils are generally more fertile than those in Zanzibar, and this appears to be largely due to the compactness or relative imperviousness of parent sediments which prevents exhaustive leaching.

228. The main types of soils distinguished in Pemba are as follows:—

Utasi.—This includes the greyish loamy soils of the high-level flat country, which occur typically with a “fuawe” horizon at 4–6 feet. In general these soils are very fertile for all crops. This may be due to a considerable extent to the “fuawe” horizon checking drainage and maintaining good growing conditions.

Ndamba.—This type occurs patchily within the *utasi* and, fortunately, is not widely distributed. It is a poor wet heath sand and grows only poor grass and the *ndamba* bush. The reason for its wetness is that a compacted “fue mweusi” horizon occurs at about 3 feet.

These two types seem to suggest an old marine platform formed as the sea retreated, with the *ndamba* representing poor peaty enclaves.

Semi-utasi.—This type includes the grey-surfaced soils of the moderate slopes usually fringing the *utasi* country. These soils are usually heavier at depth than the *utasi* and *ndamba* and show a striking mottled appearance. This indicates sluggish drainage conditions, and shows that the *semi-utasi* is unlike the *utasi*, which by its open texture allows water to percolate slowly downwards, and also unlike the *bopwe*, which sheds a good deal of moisture from its steep surface and does not develop sluggish drainage conditions. The fertility of the *semi-utasi* is more variable than that of the *utasi* and the *bopwe*, but in general it is a fairly good clove soil.

Bopwe.—Soils of this type are the main clove soils of Pemba. They occur on steep slopes and are the most reddish soils of that island, though in fact they are no more than a warm brown in colour. The most striking fact about these soils is their relative shallowness and rawness above the parent sediments. In technical terms they are “truncated”, that is the surface has been pared off. This probably occurs slightly every rainy season and, where not excessive so that the whole soil becomes unstable or the surface too raw to maintain a good cover, is possibly advantageous in keeping fresh minerals relatively near the surface. The steep slopes prevent water-logging by shedding excess water. Some very fine clove trees can be seen on this type of soil.

Bonde.—This type represents the sandy bottom lands of the *bopwe* country and is used for rice cultivation. Being mainly composed of sand washed down from the higher lying soils it is not markedly fertile and in places may be sour and peaty.

Mtifutifu.—This is the name given to the sandy soils in the north-east of Pemba. They are excellent for coconuts and food-crops but too dry for cloves. In contrast to the previous types mentioned they are low-level soils and were probably originally derived from the higher lying soils. A fairly high-water table helps to maintain the fertility of this type for, although surface conditions are drying, considerable moisture exists below.

Kinako.—These soils also occur in the east Chanjaa country of Pemba, and roughly form a southerly extension of the *mtifutifu*. They are however quite different from the *mtifutifu* and characterised by a heavy structure and a limestone parent material. They are very similar to the *kinamo* of Zanzibar. They are predominantly rice soils, but on slight rises all food-crops do well. The reason for this fertility are that the parent material is rich in bases and the weathering conditions are such that little loss by leaching occurs.

Makaani.—This is the Pemba soil which correlates with the *wanda* of Zanzibar. The *makaani* is however more fertile than the *wanda*. Both types are young in the sense that they are derived from geologically young limestones. The *wanda* is however very highly draining and oxidising, leading to reddish types, while the *makaani* is less highly draining and oxidising and tends to brownish soils. This probably explains the greater fertility of the *makaani*.

229. Before the Government Chemist left Pemba suitable sites for manurial experiments were selected on most of the more important soil types, and a number of microplots were laid down.

230. Exhibits of soils were prepared and explained at Agricultural Shows held at Konde in Pemba and Makunduchi in Zanzibar.

SECTION III.—PRINCIPAL AGRICULTURAL LEGISLATION

231. The following legislation was enacted during the year:—

Government Notice No.		Date
30	The Acquisition of Land (Assessment of Compensation) Decree, 1949. The main Decree No. 1 of 1948 was brought into force	12— 2—49
„	No. 31 The Land Acquisition (Amendment) Decree, 1949. The amendment Decree No. 2 of 1948 was brought into force	12— 2— 49
„	No. 44 The Disease of Animals Rules, 1923	26— 2—49
„	No. 70 The Disease of Animals Rules, 1923. These two notices made under Cap. 128 made the dipping of animals in certain areas compulsory	23— 4—49
„	No. 74 The Minimum Wage (Dairy Employees) Order, 1949. This Order made under Decree No. 1 of 1935 specifies a minimum wage of Shs. 1/65 per day of not less than 7 working hours for dairy employees in certain areas	30— 4—49
„	No. 94 The Animal Diseases (Compulsory Dipping Areas) Order, 1949. Declares certain areas to be compulsory dipping areas under the new Decree No. 22 of 1948	11— 6—49
„	No. 96 The Animal Diseases Regulations, 1949. General regulations made under the new Decree No. 22 of 1948	11— 6—49
„	No. 97 The Animal Diseases Regulations, 1949. Specifies the areas where dipping fees must be paid	18— 6—49
„	No. 100 The Animal Diseases Decree, 1949. The Animal Diseases Decree No. 22 of 1948 was brought into force	25— 6—49
„	No. 101 Establishment of Quarantine Station. Declares a certain area to be a Quarantine Station in Zanzibar under Decree No. 22 of 1948	25— 6—49
„	No. 103 Prices for the Purchase of Cloves. Made under Cap. 118 this notice fixes the prices to be paid by the Clove Growers' Association for cloves and clove-stems for the period 1st July, 1949, to 30th June, 1950	30— 6—49
„	No. 104 The Agricultural Produce Export (Copra) Rules, 1949. These Rules made under Cap. 116 for the inspection and grading of copra prior to export	9— 7—49
„	No. 106 The Animal Diseases (Compulsory Dipping Areas) (No. 2) Order, 1949. Made under Decree No. 22 of 1948 declares areas in Zanzibar and Pemba to be compulsory dipping areas	16— 7—49
Decree	No. 13 The Agricultural Produce (Amendment) Decree, 1949. Amends Decree No. 13 of 1937. It prohibits the removal of produce by night. It also removes the obligation to present produce for examination at specified points in town. Various offences are defined and the onus of proving lawful possession of produce suspected of being stolen is placed on the possessor. This Decree had not at the end of 1949 been brought into force.	—

		<i>Date</i>
Government Notice No. 120	The Plantation Workers (Clove-Picking Contracts) Regulations, 1949. Under Decree No. 11 of 1946 prescribes a standard contract for clove-pickers for the 1949-50 clove harvest	6— 8—49
„	No. 150 The Plantation Workers (Clove-Picking Contracts) (Amendment) Regulations, 1949. Under Decree No. 11 of 1946 prescribes terms and conditions to be embodied in clove-pickers' contracts	... 10— 9—49
„	No. 162 The Agricultural Produce Export (Mangrove Bark) (Amendment) Rules, 1949. Under Cap. 116 prohibits the stripping of mangrove bark for export from small trees. Export standards are also defined	... 17— 9—49

STAFF AND GENERAL

232. The normal incidence of leaves favoured the staff position throughout the year, and the steady progress in fertiliser and other work reflects this circumstance. It might not be out of place to mention that during the year both Assistant Veterinary Officers were in the United Kingdom qualifying for higher grade posts, and one Assistant Agricultural Officer out of the three then available proceeded to Trinidad for the same purpose.

O. S. SWAINSON,
Director of Agriculture

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Appendix I

STATEMENT OF REVENUE AND EXPENDITURE OF
GOVERNMENT PLANTATIONS

REVENUE					
				<i>Shs. cts.</i>	<i>Shs. cts.</i>
Cloves	...	...	...	32,552	23
Coconuts	...	...	...	444,229	47
Miscellaneous	...	...	...	6,953	26
Leased plantations	...	...	...	1,200	00
Hire of Lorry	...	...	...	1,510	60
House rent	...	...	...	958	58
				487,404	14
<i>Less</i> value of Produce brought over from 1948	...	...	...	86,538	25
				400,865	89
<i>Add</i> value of Produce carried over to 1950	...	...	...	19,017	00
				419,882	89

EXPENDITURE					
Personal Emoluments	...	...	...	44,804	80
Other Charges	...	...	...	251,677	58
Revenue exceeds Expenditure by	...	...	...	123,400	51
				=	
					£6,170.0.51

Appendix II

REVENUE AND EXPENDITURE OF GOVERNMENT PLANTATIONS

REVENUE

	<i>Kidichi</i>		<i>Selem</i>		<i>Mtoni</i>		<i>Chukwani</i>		<i>Total</i>	
Sale of :	Shs.	Cts.	Shs.	Cts.	Shs.	Cts.	Shs.	Cts.	Shs.	Cts.
Cloves & stems	26,105	91	6,096	32	350	00	...	...	32,552	23
Copra	208,820	86	49,082	60	90,945	61	45,709	44	394,558	51
Coconuts	20,486	06	5,675	56	13,249	96	2,980	38	42,391	96
Coconut crops	...	...	455	00	4,491	00	2,330	00	7,279	00
Miscellaneous	2,936	75	976	81	2,900	20	139	50	6,953	26
Leased plantations	...	...	1,200	00	...	...	...	...	1,200	00
Hire of lorry	781	60	271	06	244	40	214	20	1,510	60
House rent	516	49	265	24	179	85	...	...	958	58
	259,647	07	64,022	53	112,361	02	51,373	52	487,404	14

Less value of produce
brought forward:-

43,401	50	10,030	48	22,949	41	10,156	86	86,538	25
216,245	57	53,992	05	89,411	61	41,216	66	400,865	89

Add value of produce
carried forward :-

Coconuts at Shs 120/-
per 1,000

12,212	40	...	...	2,679	00	4,125	60	19,017	00
228,457	97	53,992	05	92,090	61	45,342	26	419,882	89

EXPENDITURE

Personal emoluments	8,569	92	4,625	00	2,818	30	495	00	16,508	22
Transport expenses	1,503	32	1,071	95	414	16	307	37	3,296	80
Materials and tools	1,405	90	289	22	411	30	184	55	2,290	97
Labour	121,364	21	39,377	40	37,658	07	33,971	18	232,370	86
Repairs to buildings	3,876	05	3,254	18	1,179	40	2,012	19	10,321	82
Fuel and maintenance of lorry	1,754	91	609	84	550	59	481	79	3,397	13
Total expenditure	138,474	31	49,227	59	43,031	82	37,452	08	268,185	80

Profit	89,983 66	4,764 46	49,058 79	7,890 18	151,697 09
Loss	***	***	***	***	***
			NETT GAIN	Shs.	151,697 09

Appendix III

DISTRIBUTION OF PLANTING MATERIAL — FOODSTUFFS

	<i>Zanzibar Station Including Kizimbani</i>		<i>Pemba Stations</i>	<i>Total</i>
Banana suckers	Nos.	500	60	560
Maize (white maratha) seed	lb.	1,040	...	1,040
Groundnut	lb.	55	...	55
Cassava cuttings	Nos.	627,250	50,000	677,250
Sweet Potato cuttings	Nos.	126,000	29,600	155,600
Cowpeas	lb.	28	...	28
Haricot beans	lb.	17	...	17
Cluster beans	lb.	3	...	3
Yams	lb.	327	...	327
Dwarf Sorghum (hegari)	lb.	138	...	138
Cucumber seed	ozs.	4	...	4
Gram	lb.	10	...	10
Bambarra groundnut	lb.	8	...	8
Rice (paddy)	lb.	1,501	50,326	51,827
Millet	lb.	12	...	12
Colocasia	pakachas.	9	...	9
Akra	ozs.	2	...	2
Kunde	lb.	...	62	62
Choroko	lb.	...	45	45
Mtama	lb.	...	240	240
Tannia tubers	bags.	...	5	5

Appendix IV

DOMESTIC EXPORTS, 1949

<i>Items</i>	<i>Unit of Quantity</i>	<i>Quantity</i>	<i>Value</i>	<i>Percentage of Total value</i>
Cloves	Cental of 100 lb.	169,981	£. 843,993	40.20
Clove bud and stem oil	lb.	320,882	77,058	3.67
Copra	ton.	7,922	424,938	20.24
Coconuts	cwt.	1,174	1,217	0.06
Oil cake	„	104,265	70,781	3.37
Soap, common and toilet	„	7,619	26,126	1.24
Coconut Oil	„	130,791	582,039	27.72
Mangrove bark	ton.	...	...	...
Chillies	cwt.	308	2,002	0.10
Fruit, fresh	„	11,501	6,643	0.32
Beche de mer	„	338	1,334	0.06
Tobacco, unmanufactured	lb.	150,699	3,804	0.18
Ox hides	cwt.	613	4,657	0.22
Skins, sheep and goat	„	192	2,690	0.13
Livestock	no.	...	...	...
Forest products	value	...	863	0.04
Kapok	cwt.	482	4,141	0.19
Fibres, manufactured	ton.	145	9,216	0.44
Shells, marine	cwt.	4,858	7,889	0.38
Fish, dried or salted	cwt.	506	4,388	0.21
Fish, fresh	cwt.	285	1,194	0.06
Lime	cwt.	58,690	6,100	0.29
Other unclassified natural products		...	6,208	0.29
Other articles		...	12,402	0.59
			2,099,683	100.00

Appendix V

DISTRIBUTION OF PLANTING MATERIAL—FRUIT AND MISCELLANEOUS

		<i>Kizimbani</i>	<i>Pemba</i>	<i>Total</i>
Budded orange	Nos.	3,128	122	3,250
„ grapefruit	„	83	..	83
„ mandarin	„	89	...	89
„ pomelo	„	80	...	80
Smooth lemon seedlings	„	26	...	26
Sweet lemon seedlings	„	85	18	103
Avocado pear	„	3	...	3
Lime seedlings	„	95	3	98
Sapodilla seedlings	„	16	...	16
Durian seedlings	„	25	...	25
Coffee seedlings	„	1,442	1,154	2,596
Nutmeg seedlings	„	83	...	83
Kudzu (<i>Pueraria phaseoloides</i>) seed	lb.	56	...	56
Pineapple suckers	Nos.	600	...	600
Sunflower (white) seed	lb.	68	...	68
Marcotted litchi	Nos.	25	...	25
Mango (muyuni) seedlings	„	43	...	43
Rambutan seedlings	„	324	...	324
<i>Eugenia javanica</i> seedlings	„	29	...	29
Jack fruit seedlings	„	9	767	776
Cashew nut seed	lb.	2	...	2
Pemba grass	pakachas	48	..	48
Madras thorn seed	lb.	3	...	3
Cocoa seedlings	Nos.	11,067	30	11,097
Molasses grass	pakachas	6	...	6
Jangombe (<i>Digitaria</i>)	„	18	...	18
<i>Minutiflora</i>	„	2	...	2
Pemba grass seed	lb.	4	...	4
Breadfruit seedlings	Nos.	...	71	71
Pepper <i>nigrum</i> seedlings	„	...	21	21
<i>Eugenia aquea</i> seedlings	„	...	72	72
<i>Anona squamosa</i> seedlings	„	...	10	10
Mango seedlings	„	...	183	183

Appendix VI

YIELDS OF MATURE CACAO TREES

(A) JAVA CRIOLLO (DUNGA) 54 TREES

	<i>Number of pods harvested</i>				
	1945	1946	1947	1948	1949
January	Not picked	298	255	62	562
February	„	26	49	31	77
March	„	29	...	26	87
April	„	29	...	12	86
May	„	94	65	...	131
June	„	4	50	6	323
July	„	...	...	9	160
August	17	...	...	...	3
September	14	...	...	12	...
October	13	148	17	101	38
November	47	150	314	231	746
December	59	976	125	252	430
Total	150	1,754	875	742	2,643

(B) FORASTERO (KINUNI MOSHI) 6 TREES

<i>Tree No.</i>	<i>Number of pods harvested</i>							<i>Average</i>
	1943	1944	1945	1946	1947	1948	1949	
2	113	66	129	83	48	121	111	96
3	34	11	47	34	9	39	67	34
4	194	117	83	52	52	225	252	139
7	80	67	67	66	28	39	140	70
9	40	47	118	60	43	49	355	102
15	88	17	68	14	76	93	225	83
Total	549	325	512	309	256	571	1,150	524

Appendix VII

OIL PALM YIELDS AT KIZIMBANI

		1942	1943	1944	1945	1946	1947	1948	1949
Number of palms		362	362	360	339	339	339	338	320
Number of bunches harvested		1,068	704	1,050	1,230	1,093	1,187	1,071	1,753
Average weight per bunch	lb.	15.8	21.9	30.5	29.3	25.3	32.7	30.0	31.0
Heaviest bunch	lb.	48	58	76	68	80	102	88	...
Average weight fruit per bunch	lb.	10.5	16.7	26.0	19.0	16.2	18.5	18.0	17.6
Average weight oil per bunch	lb.	1.01	1.24	2.10	1.80	1.45	1.76	1.76	1.14
Average weight oil per palm	lb.	...	...	6.4	6.2	4.69	6.19	5.58	6.20
Weight of oil per 100 lb. fruit	lb.	6.49	7.52	6.40	0.37	8.96	9.50	10.2	6.66
Weight of oil prepared	lb.	728	871	1,727	2,293	1,588	2,100	1,886	2,000

Appendix VIII

FERTILISER TRIALS RESULTS

A. MAIZE ON CHANGA SOIL AT SELEM

Design : 4²

Treatments: N1 = 1 cwt. per acre sulphate of ammonia.

N2 and N3 = double and triple the above.

P1 = 2.1 cwt. per acre sodaphosphate.

P2 and P3 = double and triple the above.

Results : lb. per acre,

	N0	N1	N2	N3	Average
P0	383	143	433	298	314
P1	510	405	518	1,018	613
P2	338	280	550	588	439
P3	700	445	640	908	673
Average	483	318	535	703	509

Significant responses = $P'N'' @ P = 0.01$

$N'N'' @ P = 0.05$

Economic Data (per acre.)

<i>Treatment</i>	<i>Yield increase over control lb.</i>	<i>Value Shs.</i>	<i>Fertiliser cost Shs.</i>	<i>Profit Shs.</i>	<i>Loss Shs.</i>
Average N1	-165	-28.05	25.30	...	53.35
Average N2	52	8.84	50.60	...	41.76
Average N3	220	37.40	75.90	...	38.50
Average P1	299	50.83	35.08	15.75	...
Average P2	125	21.25	70.15	...	48.90
Average P3	359	61.03	105.23	...	44.20
N1 P1	22	3.74	60.38	...	56.64
N2 P2	167	28.39	120.75	...	92.36
N3 P3	525	89.25	181.13	...	91.88

B. MAIZE ON CHANGA SOIL AT KIZIMBANI

Design : 4²*Treatments*: N1 = 1 cwt. per acre sulphate of ammonia.

N2 and N3 = double and triple the above.

P1 = 2.1 cwt. per acre sodaphosphate.

P2 and P3 = double and triple the above.

Results : lb. per acre.

	N0	N1	N2	N3	Average
P0	328	565	533	683	527
P1	498	748	948	1,123	829
P2	1,315	850	1,120	1,000	1,071
P3	710	823	1,260	1,335	1,032
Average	713	746	965	1,035	863

Significant responses = P' @ P = 0.05

N' approached significance.

Economic Data (per acre.)

<i>Treatment</i>	<i>Yield increase over control lb.</i>	<i>Value Shs.</i>	<i>Fertiliser cost Shs.</i>	<i>Profit Shs.</i>	<i>Loss Shs.</i>
Average N1	33	5.61	25.30	...	19.69
Average N2	252	42.84	50.60	...	7.76
Average N3	322	54.74	75.90	...	21.16
Average P1	302	51.34	35.08	16.26	...
Average P2	544	92.48	70.15	22.33	...
Average P3	505	85.85	105.23	...	19.38
N1 P1	420	71.40	60.38	11.02	...
N2 P2	792	134.64	120.75	13.89	...
N3 P3	1,007	171.19	181.13	...	9.94

C. RICE ON CHANGA SOIL AT KISONGONI

Design : 4²

Treatments: N1 = 1 cwt. per acre sulphate of ammonia.
 N2 and N3 = double and triple the above.
 P1 = 2.1 cwt. per acre sodaphosphate.
 P2 and P3 = double and triple the above.

Results : lb. per acre.

	N0	N1	N2	N3	Average
P0	760	800	1,720	600	970
P1	680	1,760	1,200	1,160	1,200
P2	1,560	1,080	1,760	1,760	1,540
P3	1,280	1,360	1,880	1,760	1,570
Average	1,070	1,250	1,640	1,320	1,320

Significant responses = P' @ P = 0.01
 N' @ P = 0.05
 N' ' P' @ P = 0.05
 N' ' ' P' ' ' @ P = 0.05

Economic Data. (per acre).

Treatment	Yield increase over control lb.	Value Shs.	Fertiliser cost Shs.	Profit Shs.	Loss Shs.
Average N1	180	37.80	25.30	12.50	...
Average N2	570	119.70	50.60	69.10	...
Average N3	250	52.50	75.90	...	23.40
Average P1	230	48.30	35.08	13.22	...
Average P2	570	119.70	70.15	49.55	...
Average P3	600	126.00	105.23	20.77	...
N1 P1	1,000	210.00	60.38	149.62	...
N2 P2	1,000	210.00	120.75	89.25	...
N3 P3	1,000	210.00	181.13	28.87	...

D. RICE ON CHANGA SOIL AT MAHONDA

Design : 4²

Treatments: N1 = 1 cwt. per acre sulphate of ammonia.
 N2 and N3 = double and triple the above.
 P1 = 2.1 cwt. per acre sodaphosphate.
 P2 and P3 = double and triple the above.

Results : lb. per acre.

	N0	N1	N2	N3	Average
P0	360	360	640	560	480
P1	480	960	960	640	760
P2	440	560	880	960	710
P3	520	720	1,080	1,240	890
Average	450	650	890	850	710

Significant responses = N' @ P = 0.01
 P' ' ' @ P = 0.01
 P' @ P = 0.05
 N' × P' approached significance.

Economic Data (per acre).

<i>Treatment</i>	<i>Yield increase over control lb.</i>	<i>Value Shs.</i>	<i>Fertiliser cost Shs.</i>	<i>Profit Shs.</i>	<i>Loss Shs.</i>
Average N1	200	42.00	25.30	16.70	...
Average N2	440	99.40	50.60	41.80	...
Average N3	400	84.00	75.90	8.10	...
Average P1	280	58.80	35.08	23.72	...
Average P2	230	48.30	70.15	...	21.85
Average P3	410	86.10	105.23	...	19.13
N1 P1	600	126.00	60.38	65.62	...
N2 P2	520	109.20	120.75	...	11.55
N3 P3	880	184.80	181.13	3.67	...

E. SORGHUM ON KINONGO SOIL AT MAKUNDUCHI

Design : 4²

Treatment: N1 = 1 cwt. per acre sulphate of ammonia.
 N2 and N3 = double and triple the above.
 K1 = 1 cwt. per acre of muriate of potash.
 K2 and K3 = double and triple the above.

Results : lb. per acre.

	N0	N1	N2	N3	Average
K0	475	525	550	1,275	706
K1	325	575	775	950	656
K2	500	625	900	1,475	875
K3	275	825	975	1,225	825
Average	394	638	800	1,231	764

Significant responses = N' @ P = 0.01
 N' ' ' @ P = 0.01
 K' approached significance.

Economic Data (per acre).

<i>Treatment</i>	<i>Yield increase over control lb.</i>	<i>Value Shs.</i>	<i>Fertiliser cost Shs.</i>	<i>Profit Shs.</i>	<i>Loss Shs.</i>
Average N1	244	73.20	25.30	47.90	...
Average N2	406	121.80	50.60	71.20	...
Average N3	837	251.10	75.90	175.20	...
Average K1	— 50	— 15.00	28.20	...	43.20
Average K2	169	50.70	56.40	...	5.70
Average K3	119	35.70	84.60	...	48.90
N1 K1	100	30.00	53.50	...	23.50
N2 K2	425	127.50	107.00	20.50	...
N3 K3	750	225.00	160.50	64.50	...

F. MAIZE ON KINONGO SOIL AT MKWAJUNI

Design : 4²

Treatments: N1 = 1 cwt. per acre sulphate of ammonia.
 N2 and N3 = double and triple the above.
 K1 = 1½ cwt. per acre muriate of potash.
 K2 and K3 = double and triple the above.

Results : thousands of cobs per acre.

	N0	N1	N2	N3	Average
K0	15.0	22.8	20.2	21.3	19.8
K1	18.8	19.2	19.5	21.2	19.7
K2	20.4	20.5	19.1	19.6	19.9
K3	16.8	18.8	20.6	20.1	19.0
Average	17.8	20.3	19.8	20.6	19.6

Significant responses = N''' @ P = 0.05
 N'' K'' approached significance.

G. RICE ON NAMO SOIL AT CHEJU

Design : 4²

Treatments: N1 = 1 cwt. per acre sulphate of ammonia.
 N2 and N3 = double and triple the above.
 P1 = 2.1 cwt. per acre sodaphosphate.
 P2 and P3 = double and triple the above.

Results : lb. per acre.

	N0	N1	N2	N3	Average
P0	920	920	1,640	1,160	1,160
P1	840	1,720	2,800	2,760	2,030
P2	1,560	1,840	2,360	2,640	2,100
P3	1,640	1,960	2,160	2,560	2,080
Average	1,240	1,610	2,240	2,280	1,843

Significant responses = N' @ P = 0.01
 P' @ P = 0.01
 P'' @ P = 0.01
 P''' @ P = 0.01
 N' P'' @ P = 0.05

Economic Data (per acre).

Treatment	Yield increase over control lb.	Value Shs.	Fertiliser cost Shs.	Profit Shs.	Loss Shs.
Average N1	370	77.70	25.30	52.40	...
Average N2	1,000	210.00	50.60	159.40	...
Average N3	1,040	218.40	75.90	142.50	...
Average P1	870	182.70	35.08	147.62	...
Average P2	940	197.40	70.15	127.25	...
Average P3	920	193.20	105.23	87.97	...
N1 P1	800	168.00	60.38	107.62	...
N2 P2	1,440	302.40	120.75	181.65	...
N3 P3	1,640	344.40	181.13	163.27	...

H. SUNFLOWERS ON KINONGO (UWANDA) SOIL AT HANYEGWA MCHANA

Design : 3³

Treatment : N1 = 1 cwt. per acre sulphate of ammonia.
 P1 = 1 cwt. per acre sodaposphate.
 K1 = 1 cwt. per acre sulphate of potash.
 N2, P2 and K2 = double the above respectively.

Results : lb. per acre.

N0	358	P0	412	K0	202
N1	412	P1	405	K1	513
N2	545	P2	498	K2	599

Significant responses = K' @ P = 0.01

N' @ P = 0.01

K'' (neg) @ P = 0.05

Economic Data (per acre).

Treatment	Yield increase over control lb.	Value Shs.	Fertiliser cost Shs.	Profit Shs.	Loss Shs.
Average N1	57	11.88	25.30	...	13.42
Average N2	187	41.14	50.60	...	9.46
Average P1	-7	-1.54	16.78	...	18.32
Average P2	86	18.92	33.55	...	14.63
Average K1	311	68.42	28.20	40.22	...
Average K2	397	87.34	56.40	30.94	...

I. MINOR ELEMENTS TRIAL ON MAIZE AT HANYEGWA MCHANA

Design : 2³ with plots split for N.

Treatment: A = { Iron sulphate @ 10 lb. per acre.
 Manganese salts @ 10 lb. per acre.
 Copper sulphate @ 2 lb. per acre.
 B = { Magnesium sulphate @ 20 lb. per acre.
 Borax @ 10 lb. per acre.
 Zinc sulphate @ 2 lb. per acre.
 C = { Nickel-ammonium sulphate @ 20 lb. per acre.
 Cobalt nitrate @ 2 lb. per acre.
 Ammonium molybdate @ 2 lb. per acre.
 N = Sulphate of ammonia @ 3 cwt. per acre.

Results : Responses in lb. per acre.

Total yield	=	398
Main effect A	=	141 ++
Main effect B	=	- 116 +
Main effect C	=	44
Interaction A × B	=	- 31
Interaction A × C	=	64
Interaction B × C	=	36
Interaction A × B × C	=	- 24
Standard error	=	+ 42.1

Nitrogen plots averaged 220.6 per acre.

Non-nitrogen plots averaged 177.5 lb. per acre.

J. TYPES OF PHOSPHATE TRIAL ON MAIZE ON CHANGA SOIL AT

KIZIMBANI

Design : 5 × 5 Latin square with plots split for N

Treatments : Sodaphosphate @ 2.1 cwt. per acre
 Superphosphate @ 2.3 cwt. per acre
 Triple phosphate @ 1.0 cwt. per acre
 Guano @ 1.3 cwt. per acre
 Control — no manure
 N as sulphate of ammonia @ 3 cwt. per acre

Results : Superphosphate 748.2 lb. per acre maize
 Sodaphosphate 578.7 lb. per acre maize
 Triple phosphate 548.4 lb. per acre maize
 Guano 520.7 lb. per acre maize
 Control 187.7 lb. per acre maize
 @P = 0.01 Control lower than all others
 Triple and guano lower than supers
 @P = 0.05 Soda lower than supers

Nitrogen plots averaged 550.1 lb per acre

Non-nitrogen plots averaged 478.8 lb. per acre

Insignificant, also no significant interactions

K. CASSAVA ON CHANGA SOIL AT KIZIMBANI

Design : 3³

Treatments : N1 = 2 cwt. sulphate of ammonia per acre
 P1 = 2 cwt. sodaphosphate per acre
 K1 = 2 cwt. sulphate of potash per acre
 N2, P2 and K2 = double the above respectively

Results : tons per acre

N0 = 6.33	P0 = 5.80	K0 = 5.68
N1 = 5.16	P1 = 5.47	K1 = 6.20
N2 = 5.53	P2 = 6.21	K2 = 5.60

All responses insignificant

. MAIZE ON KINAKO SOIL AT OLE

Design : 3^4

Treatments : N1 = Sulphate of ammonia @ 2 cwt per acre
 P1 = Sodaphosphate @ 2 cwt. per acre
 K1 = Sulphate of potash @ 2 cwt per acre
 L1 = Lime @ $1\frac{1}{2}$ tons per acre

N2, P2, K2 and L2 = double the above respectively

Results : lb. per acre field weight of cobs

N0 = 1897	P0 = 1849	K0 = 1996	L0 = 1915
N1 = 1813	P1 = 1930	K1 = 2133	L1 = 2115
N2 = 2499	P2 = 2429	K2 = 2080	L2 = 2178

Significant responses = N @ P = 0.01
 P @ P = 0.01
 K'P' (neg) and K'P'' @ P = 0.05
 L'P' (neg) @ P = 0.01

M. RICE ON MTIFUTIFU SOIL AT KONDE

Design : 3^4

Treatments : N1 = Sulphate of ammonia @ 2 cwt. per acre
 P1 = Sodaphosphate @ 2 cwt. per acre
 K1 = Sulphate of potash @ 2 cwt. per acre
 L1 = Lime @ $1\frac{1}{2}$ tons per acre

N2, P2, K2 and L2 = double the above respectively

Results : lb. per acre paddy

N0 = 338	P0 = 344	K0 = 324	L0 = 379
N1 = 356	P1 = 349	K1 = 365	L1 = 359
N2 = 351	P2 = 352	K2 = 356	L2 = 307

All responses insignificant

Appendix IX

ANNUAL RECORD OF MILK YIELD
KIZIMBANI STATION

BREED: Zebu (Boran)

Year	Total No. of Cows in herd	Average output of milk per cow per annum lb.	No. of full time lactations	Lactation Records (lb)			Average Calving Interval in days	Average daily yield during lactation in lb.
				Average milk yield in 305 days	Range in M. Y. Minimum	Maximum		
1942	24	975	20	1,078	29 (31 days)	3,342 (359 days)	191	4.2
1943	28	792	21	851	3 (31 days)	2,232 (329 days)	160	5.4
1944	25	1,341	18	1,112	2 (5 days)	3,153 (410 days)	234	5.2
1945	29	1,531	20	1,637	6 (12 days)	4,043 (313 days)	258	5.1
1946	47	1,289	36	1,339	6 (12 days)	3,984 (297 days)	217	5.9
1947	41	1,637	33	1,682	23 (42 days)	2,976 (306 days)	268	6.3
1948	46	1,722	42	1,862	6 (19 days)	4,058 (295 days)	267	7.0
1949	62	1,700	52	1,688	19 (17 days)	2,876 (278 days)	332	7.0

OTHER INFORMATION:

(1) Method of recording yields: Daily.

(2) Type of feeding: Grazing with concentrates (Started feeding concentrates from 12th July, 1944).

(3) No. of times milking and method of feeding: Milking three times a day in 1942 to September, 1943, and twice from October, 1943. Calves bucket fed (whole milk).

(4) Average age of heifers at 1st calving: 1,110 days (3 years and 15 days).

Appendix X

APPROXIMATE PRODUCTION OF CLOVES IN FRASILAS OF
35 lb. FOR 35 CROP YEARS

(1st July to 30th June)

(Based on receipts of cloves at the Central Market and C.G.A.)

<i>Season</i>	<i>Zanzibar Frasilas</i>	<i>Pemba Frasilas</i>	<i>Total Frasilas</i>	<i>Mean crop per season in 5 year periods Frasilas</i>
1914/15	194,920	331,389	526,309	...
1915/16	141,641	655,116	796,757	...
1916/17	208,716	302,919	511,635	...
1917/18	63,958	234,239	298,197	...
1918/19	259,273	565,229	824,502	591,500
1919/20	93,847	168,703	262,550	538,700
1920/21	231,831	316,446	548,277	489,000
1921/22	65,819	200,983	266,802	440,100
1922/23	291,417	690,498	981,915	576,800
1923/24	75,027	226,767	311,794	474,300
1924/25	240,952	520,490	761,442	574,000
1925/26	219,192	392,622	611,814	586,800
1926/27	203,843	529,186	733,029	680,000
1927/28	190,370	500,382	690,752	621,800
1928/29	74,828	125,740	200,568	599,500
1929/30	318,647	610,296	928,943	633,000
1930/31	51,796	201,320	253,116	561,300
1931/32	175,070	760,786	935,856	601,800
1932/33	242,772	244,594	487,366	561,200
1933/34	146,098	781,090	927,188	706,500
1934/35	360,037	503,415	863,452	693,400
1935/36	65,938	232,571	298,509	702,500
1936/37	45,096	351,568	396,664	594,600
1937/38	446,500	909,416	1,355,916	768,300
1938/39	39,879	115,211	155,090	612,000
1939/40	168,041	501,474	669,515	575,100
1940/41	146,323	575,277	721,600	655,700
1941/42	297,578	889,550	1,187,128	817,800
1942/43	40,049	223,691	263,740	599,400
1943/44	263,423	777,218	1,040,641	776,500
1944/45	200,417	459,396	659,813	774,600
1945/46	26,493	161,075	187,568	667,800
1946/47	170,280	924,329	1,094,609	649,300
1947/48	30,914	280,986	311,900	658,900
1948/49	81,700	310,971	392,671	529,300
Average for 35 seasons	167,791	445,284	613,075	

Clove Production

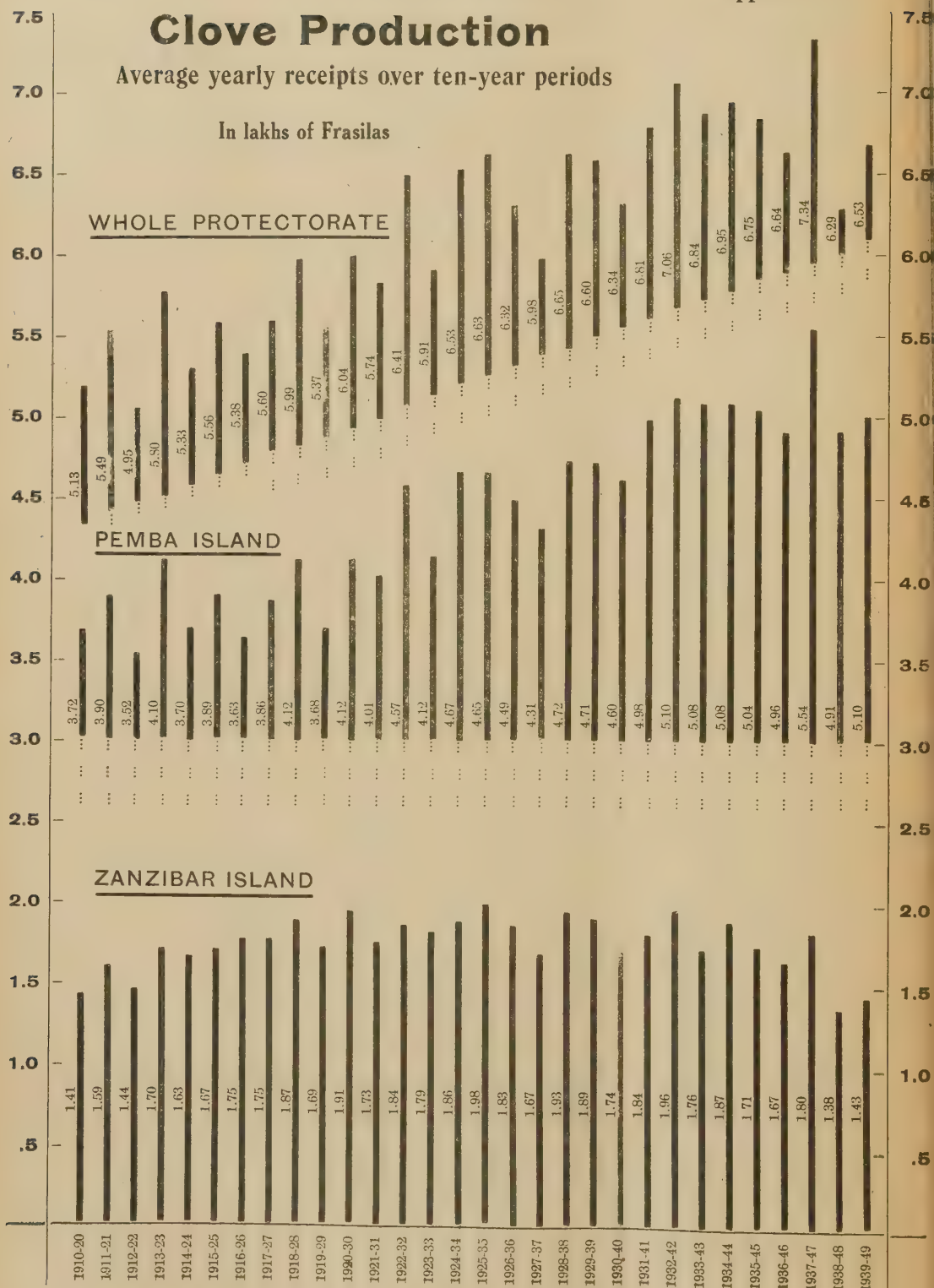
Average yearly receipts over ten-year periods

In lakhs of Frasilas

WHOLE PROTECTORATE

PEMBA ISLAND

ZANZIBAR ISLAND



Appendix XII-A

1st Order Station.

Non-Clove Growing Area

SUMMARY OF METEOROLOGICAL OBSERVATIONS AT CHUKWANI PALACE, ZANZIBAR, 1949

Lat.: 6° 15'S Long.: 39° 13'E Alt.: 61 feet. Standard Time 3h 00m East. Ref. No. 96-39/03

Month	Temperature				Relative Humidity		Extremes of Temperature of the Air				Rainfall			No. of Days		
	Dry Bulb		Dew Point		h	h	Max.	Min.	Mean Max.	Mean Min.	½ Max. + Min.	Total			Maximum Fall in 24 hours	
	8.30	14.30	8.30	14.30								mm.	ins.			
January	80.9	86.8	F	F	84	73	%	F	94.0	73.0	89.3	75.1	52.6	2.07	ins.	13
February	81.5	89.1	F	F	83	67	%	F	95.6	74.0	91.5	75.8	12.4	0.49	0.64	4
March	82.4	89.2	F	F	81	67	%	F	97.2	74.7	92.5	76.8	54.6	2.15	0.38	12
April	80.2	86.7	F	F	89	72	%	F	97.6	73.9	88.8	77.2	122.4	4.82	0.54	18
May	78.8	84.7	F	F	90	73	%	F	89.2	73.2	85.8	76.5	106.9	4.21	1.23	17
June	76.7	83.3	F	F	86	66	%	F	87.9	72.0	84.7	74.2	33.0	1.30	0.51	15
July	75.4	82.1	F	F	89	69	%	F	87.5	70.0	83.2	72.8	108.2	4.26	2.80	7
August	75.4	82.8	F	F	88	65	%	F	88.0	68.0	84.4	71.5	11.2	0.44	0.10	9
September	77.1	84.3	F	F	84	64	%	F	92.7	69.0	87.3	71.2	22.9	0.90	0.38	13
October	79.1	85.6	F	F	80	65	%	F	94.2	70.0	88.0	71.9	51.3	2.02	1.50	6
November	82.5	90.1	F	F	77	66	%	F	100.0	71.1	93.5	73.8	84.8	3.34	2.89	9
December	82.7	87.3	F	F	81	70	%	F	97.8	73.3	94.9	75.4	151.4	5.96	2.05	7
Year	79.4	86.0	74.2	74.1	84	68			100.0	68.0	88.3	74.3	811.7	31.96	2.89	126

Appendix XII-B

2nd Order Station.

SUMMARY OF METEOROLOGICAL OBSERVATIONS AT VICTORIA GARDENS, ZANZIBAR, 1949

Non-Clove Growing Area.

Lat. : 6° 10'S Long. : 39° 11'E Alt. : 18 feet. Standard Time 3h 00m East. Ref. No. 96-39/12

Month	Temperature				Relative Humidity		Extremes of Temperature of the Air				Rainfall			No. of Days Rain		
	Dry Bulb		Dew Point		h	h	Max.	Min.	Mean Max.	Mean Min.	$\frac{1}{2}$ Max. + Min.	Total	Maximum Fall in 24 hours			
	8.30	14.30	8.30	14.30	8.30	14.30								mm.	ins.	
January	F 81.4	F 86.3	F 75.4	F 75.2	% 83	% 70	F 92.4	F 73.2	F 88.2	F 75.5	F 81.9	50.3	1.98	ins. 0.86	Date 29	9
February	81.7	88.4	75.4	76.8	81	69	94.6	73.6	90.6	76.4	83.5	16.8	0.66	0.39	10	3
March	83.3	88.6	76.7	76.8	81	68	96.0	74.0	91.4	76.5	83.9	75.7	2.98	1.89	28	6
April	80.7	85.4	76.6	76.4	87	75	92.7	73.2	87.3	76.4	81.9	186.7	7.35	2.79	11	20
May	79.3	84.8	75.7	74.6	89	72	89.0	72.7	85.6	75.6	80.6	164.6	6.48	1.96	6	12
June	76.6	83.4	72.4	71.1	87	67	87.2	70.4	84.4	72.6	79.0	53.8	2.12	0.63	23	7
July	75.3	82.1	71.7	71.3	89	70	85.6	68.4	83.2	72.2	77.7	103.1	4.06	2.65	10	11
August	75.2	83.4	71.2	71.2	88	67	87.6	65.4	84.7	69.9	77.3	29.2	1.15	0.38	13	12
September	76.0	83.4	71.8	70.5	87	65	89.0	66.4	85.1	69.8	77.5	60.7	2.39	0.74	6	9
October	78.9	85.3	72.5	71.4	81	68	90.5	68.0	87.2	70.6	78.9	44.4	1.75	0.59	6	5
November	81.9	86.9	74.5	74.5	78	67	93.6	69.5	89.2	73.4	81.2	39.1	1.54	0.68	16	6
December	82.4	87.8	75.7	74.4	80	65	92.7	73.0	89.9	75.5	82.7	103.6	4.08	1.58	22	11
Year	79.4	85.5	74.1	73.7	84	69	96.0	65.4	87.2	73.8	80.5	928.0	36.54	2.79	April 11	111

Appendix XII-C

Temperature Station.

Clove Growing Area.

SUMMARY OF METEOROLOGICAL OBSERVATIONS AT KIZIMBANI, ZANZIBAR, 1949

Lat.: 6° 05'S Long.: 39° 16'E Alt.: 220 feet. Standard Time 3h 00m East. Ref. No. 96-39/11

Month	Temperature				Relative Humidity		Extremes of Temperature of the Air					Rainfall			No. of Days	Rain	
	Dry Bulb		Dew Point		h	h	%	Max.	Min.	Mean Max.	Mean Min.	½ Max. + Min.	Total				Maximum Fall in 24 hours
	8.30	14.30	8.30	14.30									mm.	ins.			
January	F	F	F	F				F	F	F	F	F	44.4	1.75	ins.	31	14
February	79.9		70.4		82	82		90.0	65.0	86.0	71.9	78.9		0.35	31	14	
March	80.7		74.7		82	82		91.0	70.0	87.8	72.9	80.3	51.3	2.02	12	2	
April	82.1		75.0		79	79		92.0	71.0	89.7	73.1	81.1	102.9	4.05	18	10	
May	79.2		74.9		87	87		91.8	71.0	86.5	73.3	79.9	267.5	10.53	9	22	
June	78.0		74.2		88	88		87.0	69.5	85.0	72.9	78.9	341.6	13.45	5	21	
July	75.8		72.3		89	89		85.0	68.0	83.5	70.3	76.9	34.5	1.36	11	11	
August	74.5		71.0		89	89		85.0	65.0	82.1	69.1	75.6	112.8	4.44	10	16	
September	74.4		70.3		87	87		86.1	62.0	83.1	66.5	74.8	23.1	0.91	31	11	
October	76.3		70.9		83	83		86.0	64.0	82.9	66.5	74.7	93.2	3.67	15	11	
November	78.8		71.2		78	78		88.1	65.0	84.0	67.9	75.9	105.9	4.17	6	10	
December	81.7		75.5		75	75		91.1	67.0	88.1	70.7	79.4	5.6	0.22	26	5	
	81.4		74.7		80	80		90.0	70.1	86.9	72.4	79.7	202.9	7.99	9	16	
Year	78.6		72.9		83	83		92.0	62.0	85.4	70.6	78.0	1385.8	54.56	3.21	May 5	149

Appendix XII-D

Temperature Station.

Clove Growing Area.

SUMMARY OF METEOROLOGICAL OBSERVATIONS AT WETE, PEMBA, 1949

Lat.: 5°04'S Long.: 39° 43'E Alt.: 60 feet. Standard Time 3h 00m East. Ref. No. 95-39/01

Month	Temperature			Relative Humidity		Extremes of Temperature of the Air				Rainfall			No. of Days Rain	
	Dry Bulb		Dew Point	h	h	Max.	Min.	Mean		Total	Maximum Fall in 24 hours	ins.		
	8.30	14.30						8.30	14.30					Max.
January	F 81.7		F 75.2	80		88.5	77.6	F 85.8	74.1	46.5	1.83	ins.	Date 14	5
February	81.6		75.3	81		89.0	72.0	87.6	74.3	78.7	3.10	1.46	12	3
March	83.3		75.4	77		92.0	72.5	89.2	74.4	7.1	0.28	2.70	18	3
April	80.8		75.8	85		89.5	72.0	86.7	74.6	420.4	16.55	0.14	11	5
May	80.5		75.7	85		89.4	69.0	85.9	73.3	201.9	7.95	3.85	23	23
June	78.7		73.4	84		86.7	68.4	84.8	71.4	20.6	1.53	1.53	23	18
July	75.9		72.2	89		85.1	66.0	82.9	69.2	137.4	0.81	0.36	15	9
August	76.0		71.4	86		84.3	65.2	82.1	67.7	82.8	5.41	1.27	15	15
September	78.5		71.6	80		85.7	65.0	83.8	68.5	32.0	3.26	0.63	2	15
October	81.0		72.3	75		89.3	66.6	86.8	69.5	3.8	1.26	0.53	25	9
November	82.6		74.3	76		90.3	70.0	87.9	72.5	18.5	0.15	0.13	27	2
December	82.1		75.3	80		89.8	70.0	86.6	74.4	97.3	0.73	0.29	23	5
Year	80.2		74.0	81		92.0	65.0	85.8	72.0	1147.0	45.16	3.85	31	16
	...												April 11	125

Appendix XII-E

Temperature Station

Clove Growing Area

SUMMARY OF METEOROLOGICAL OBSERVATIONS AT MKWAJUNI, ZANZIBAR, 1949

Lat. : 5° 53'S Long. : 39° 17' E Alt. : 165 feet. Standard time 3h 00m East. Ref. No. 95-39/11

Month	Temperature				Relative Humidity		Extremes of Temperature of the Air				Rainfall			No. of Days		
	Dry Bulb		Dew Point		h	h	Max.	Min.	Mean Max.	Mean Min.	½ Max. + Min.	Total			Maximum Fall in 24 hours	
	8.30	14.30	8.30	14.30								mm.	ins.			
					F		F		F	F	F				F	ins.
January	81.0		73.6				91.0	70.5	85.7	73.2	79.5	37.3	1.47	0.59	30	7
February	82.9		74.0				92.0	71.0	88.7	73.7	81.2	1.5	0.06	0.04	10	2
March	83.4		73.7				92.5	70.0	89.9	72.7	81.3	24.4	0.96	0.48	28	5
April	80.6		74.5				91.5	71.0	86.9	73.6	80.3	207.3	8.16	1.42	29	20
May	79.3		74.3				89.0	66.0	84.3	71.8	78.1	217.9	8.58	1.51	4	19
June	76.0		71.1				88.5	66.4	83.5	69.5	76.5	62.2	2.45	0.96	14	12
July	74.9		70.2				85.0	63.4	81.5	68.4	74.9	109.0	4.29	1.34	13	17
August	75.4		70.3				83.6	62.5	81.2	66.5	73.9	55.4	2.18	0.50	11	14
September	77.7		69.9				84.0	62.0	81.9	66.0	73.9	69.1	2.72	0.52	6	12
October	79.9		69.7				88.0	63.0	85.5	66.5	76.0	3.3	0.13	0.03	2	2
November	82.0		71.5				90.2	65.0	88.4	71.3	81.1	18.8	0.74	0.55	16	4
December	82.8		71.7				91.0	71.0	87.6	74.1	80.9	109.0	4.29	1.47	8	12
Year ...	79.7		72.0		78		92.5	62.0	85.4	70.6	78.1	915.2	36.03	1.51	May 4	126

Appendix XII-F

RAINFALL STATIONS, 1949.

	Jan.	Feb.	March	April	May	June	July	August	Sept.	October	Nov.	Dec.	Total 1949	Total 1948
Clove Growing Areas :														
Selem	Rain ...	2.16	0.09	1.24	12.29	9.29	1.14	2.88	0.59	3.82	1.44	0.30	3.11	73.86
	Wet Days ...	11	2	6	23	21	9	16	9	12	10	6	16	183
Mkokotoni	Rain ...	0.65	...	3.37	9.40	7.80	1.87	4.73	1.63	3.69	2.76	1.12	4.78	65.27
	Wet Days ...	2	...	6	21	21	10	15	10	9	5	3	9	96
Mwera	Rain ...	1.01	1.12	7.67	12.68	14.19	1.27	5.21	1.34	2.12	3.35	0.88	4.71	68.66
	Wet Days ...	9	4	12	24	17	5	12	8	5	4	3	10	151
Kigomasha	Rain ...	0.10	0.11	...	14.34	8.88	1.38	6.69	5.01	3.59	2.83	0.47	4.99	97.03
	Wet Days ...	1	1	...	16	19	5	11	10	13	8	5	12	169
Matangatiwani	Rain ...	0.16	0.17	0.27	18.56	8.57	1.41	7.78	4.48	1.94	0.69	3.68	5.76	99.37
	Wet Days ...	3	2	3	22	19	11	19	22	11	6	6	15	205
Mkoani	Rain ...	0.95	2.38	1.37	15.72	8.46	0.76	3.19	1.46	1.26	0.11	2.03	8.21	102.73
	Wet Days ...	6	2	5	20	18	9	17	10	5	1	10	17	183
Mtambile	Rain ...	6.40	0.47	2.90	20.62	8.05	0.77	6.38	0.69	2.33	0.06	6.39	16.47	98.75
	Wet Days ...	11	2	10	22	14	12	20	12	8	3	6	21	141
Limbani	Rain ...	1.12	0.97	1.82	13.63	9.07	1.08	6.86	2.00	2.12	0.33	0.78	7.19	169
	Wet Days ...	6	1	5	25	25	17	24	16	6	7	8	18	187
Wesha	Rain ...	1.68	0.93	2.91	17.15	4.55	1.27	5.84	1.82	1.64	0.37	0.67	4.72	88.39
	Wet Days ...	11	3	5	20	16	10	21	11	7	6	4	13	174
Non-Clove Growing Areas :														
Chwaka	Rain ...	0.68	0.53	1.43	14.47	6.23	2.62	3.37	0.42	2.22	...	0.29	5.88	74.30
	Wet Days ...	6	2	5	19	10	7	9	2	7	...	3	7	126
Hanyegwa Mchana	Rain ...	1.42	0.76	4.94	11.61	8.34	1.07	6.17	1.10	1.98	1.45	0.14	6.38	...
	Wet Days ...	7	1	6	21	14	5	12	4	6	2	2	9	89
Muongoni	Rain ...	1.51	1.44	4.44	6.95	5.94	0.68	3.26	0.34	1.07	0.39	0.44	2.96	29.42
	Wet Days ...	5	2	7	11	13	6	12	3	4	2	3	11	79
Makunduchi	Rain ...	2.58	0.40	0.74	6.96	6.75	1.66	3.99	0.21	1.57	0.25	0.65	2.52	28.98
	Wet Days ...	2	1	6	16	13	6	10	2	7	3	3	8	77

Note:—Rainfall in inches.

